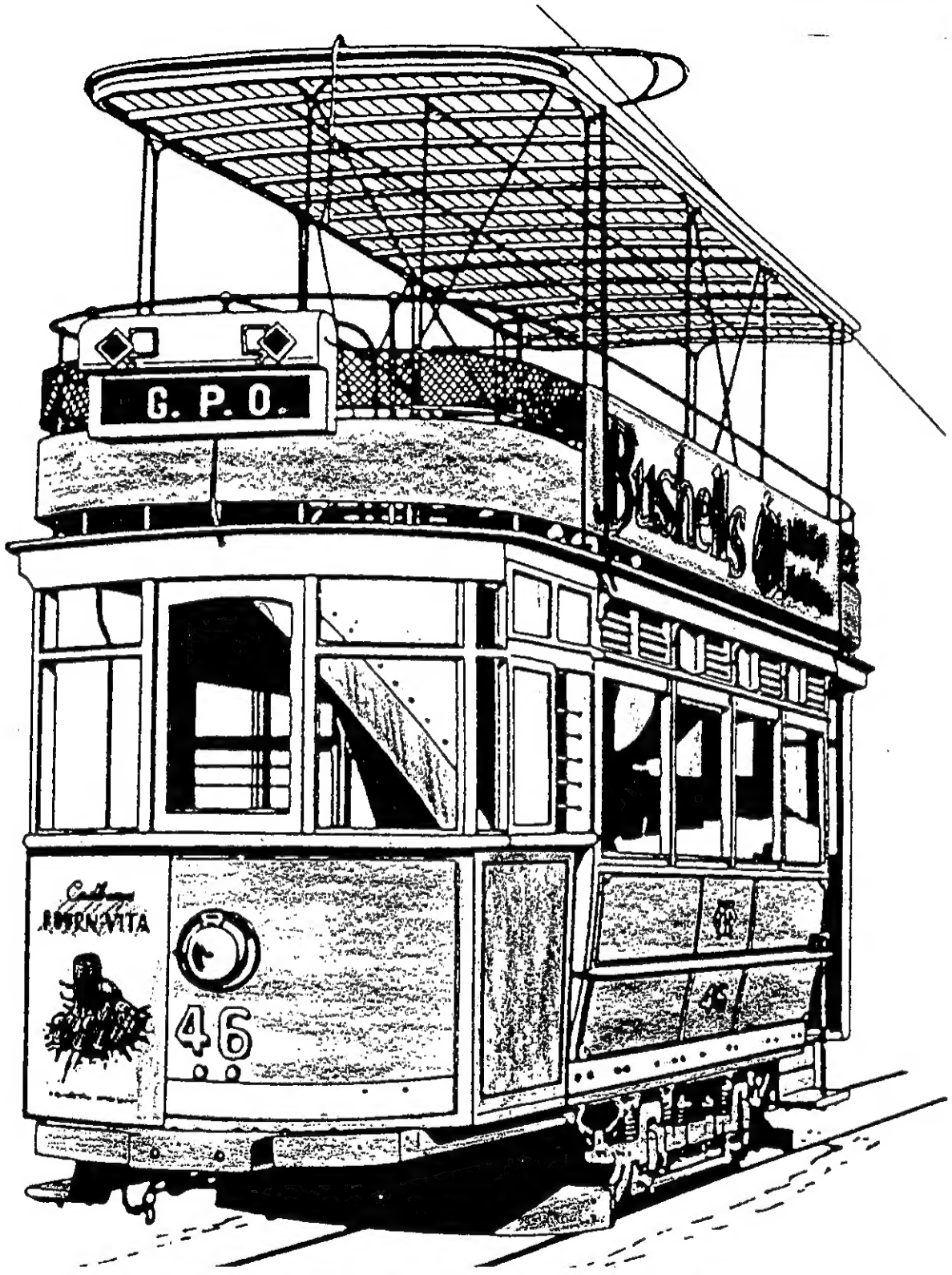
City of Hobart
Metropolitan Transport Trust
State Government of Tasmania



HOBART BACK ON TRACK

Spiller Gibbins Swan Pty Ltd
Melbourne Transport International Pty Ltd
Thompson and Brett Pty Ltd
Lesley Gulson

March, 1994

DISCLAIMER

The analysis in this research is based on information from a wide range of primary and secondary sources. All care has been taken in compiling the information and where possible within the budget available collaboration has been sought. However, no responsibility is taken for changes to market conditions or changes in other factors which may affect the conclusions.

Any person proposing to act on the basis of this report must acquaint her or himself with the analysis, the assumptions and the judgements herein and draw their own conclusion as to the probability of commercial success.

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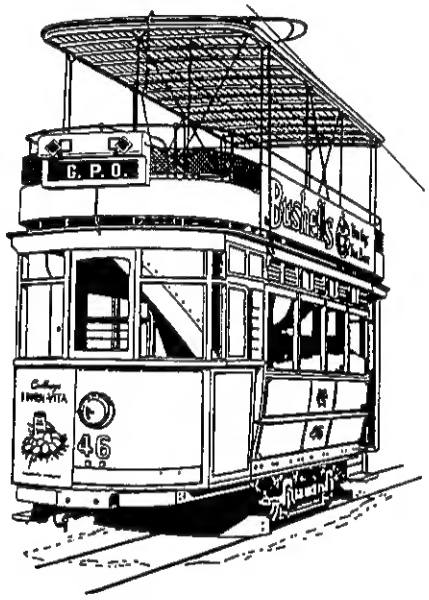

ACKNOWLEDGEMENTS

The team acknowledges the assistance of the Steering Committee, particularly that of Alderman D. Haigh whose enthusiasm is contagious. Mr. R. Banks of Banks Paton Australian Pty Ltd provided valuable advice, as did a number of others who are keen to support the project.

Mr. M. Boyd of the Bendigo Trust was forthcoming with information as was Mr. P. Winspur of the Ballarat Tramway Preservation Society. The team is grateful for their valuable insights.

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EXECUTIVE SUMMARY

The brief requires a feasibility study of a tramway from North Hobart to the CBD and possible extensions to the waterfront. Two route options have been selected.

Road, traffic, landuse and urban design issues have been investigated. There are no major constraints but there are implications for route configuration, such as the necessity for a double track in Elizabeth Street to ensure tramcars always move with the traffic flow.

Route development options have been evaluated an it is concluded that the system should be based on:

- historic 3'6" gauge;
- overhead wires;
- tourist service; and
- proven technology.

Tourist visitation to Hobart is similar to Bendigo in Victoria where a tourist tram is successfully operated. Based on parallels drawn from Bendigo revenue estimates have been made.

A new Hong Kong double decker tramcar which can be fitted out locally is recommended. Cost estimates have been prepared.

The project requires $3.2 million of initial capital of which $2.0 million would need to be sourced externally and the balance could produce a healthy commercial return. There are many ways of raising this capital including works in-kind, value capture and special rates. More work is needed in this area.

Direct and indirect benefits have been examined and are likely to be substantial. The project is cost-effective and relatively risk free and it provides a unique opportunity to mobilise latent economic resources building on the heritage transport theme.

It is concluded that the project is an important initiative which should be pursue and it can be initiated with a quite modest up-front commitment from the State Government.

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INTRODUCTION

1.1 THE BRIEF

The Hobart City Council in conjunction with the Metropolitan Transport Trust and the State Government has commissioned this study to examine the feasibility of re-establishing an electric double-decker tram service in the City of Hobart.

There is growing community support for reintroduction of such a service. A double-decker tramway would provide an added attraction to the Hobart streetscape and it would be developed as a tourist venture, and possibly as a regular mode of public transport. There are indications of strong public and business support for the tramway proposal.

To progress the matter further a feasibility study is required to determine the long term financial viability of a tramway and the challenges involved. The proposed scheme is;

(i) construction and operation of a tramway from North Hobart to Hobart's Central business District, using Elizabeth Street;

and

(ii) extension of the track to service the waterfront (Sullivans Cove).

The principal aim of the consultancy is to identify the optimal solution in terms of performance and cost-effectiveness. Performance can be measured at two levels, firstly, on the basis of revenues and, secondly, on the basis of external benefits. The external benefits will potentially include:

- reduced road congestion and pollution;
- urban design and streetscape values;
- social values;
- increased tourism and associated expenditure.

Cost-effectiveness is measured in terms of the Present Value of all capital and recurrent costs. There are also the critical issues of funding and financing. The project will require financing to spread its costs over the period that it produces benefits.

1.2 OVERVIEW OF ROUTE OPTIONS

Figure 1.1 shows the study area and the routes that have been selected for evaluation to fulfil the requirements of the brief. The routes were selected after reconnoitre and their rationale is as follows:

- Link 1 is the priority route stated in the brief.
- Link 2a is the logical extension (from an operational point of view) to Salamanca Place which is the main tourist focus.
- Link 2b is an alternative to 2a which recognises the difficulty of traversing the Elizabeth Street Mall.

Of course, there are many variations on these routes but at this stage the fundamental question of whether to proceed must be answered. Refinement is only relevant if the answer is in the affirmative.

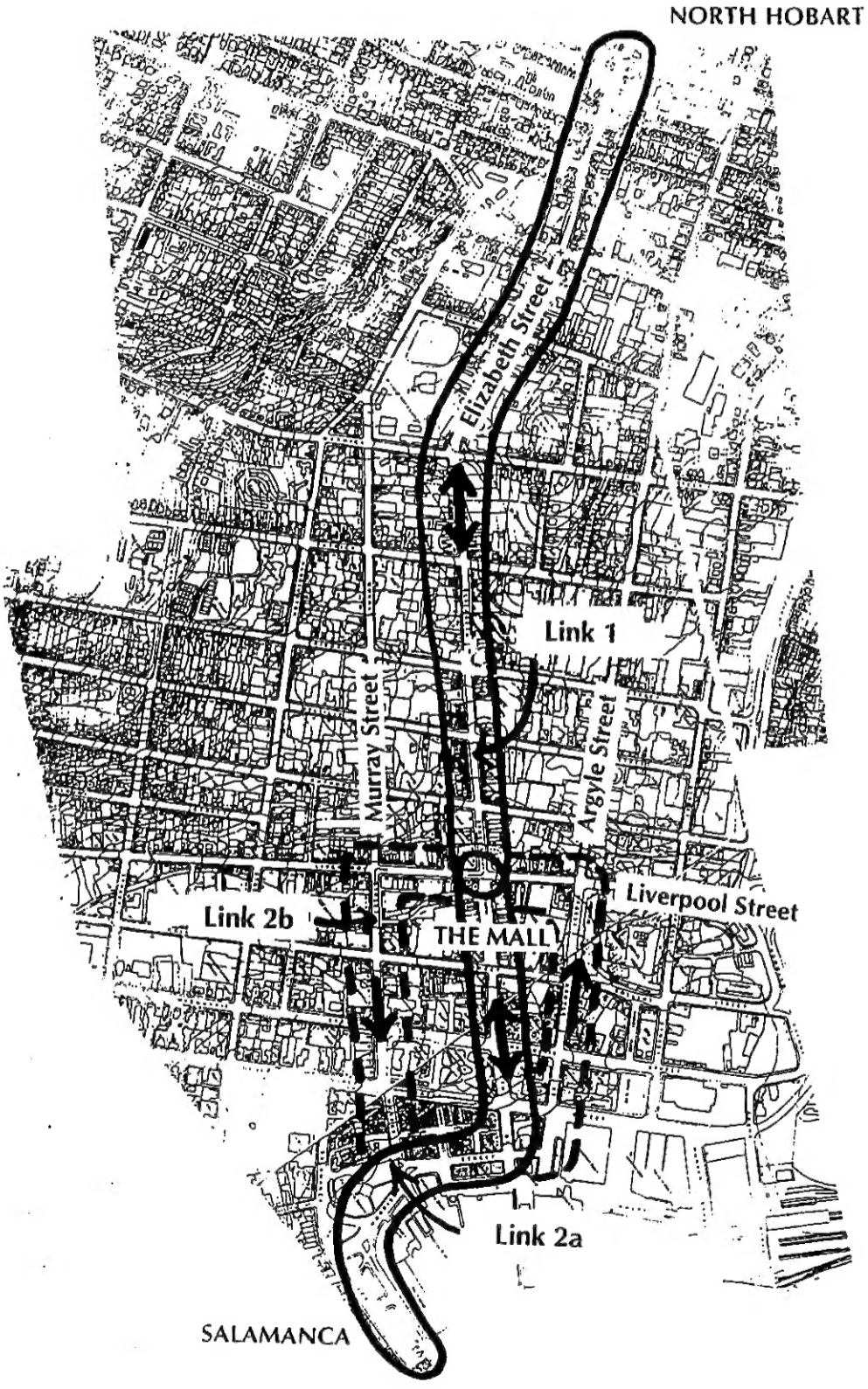


FIGURE 1.1 THE STUDY AREA AND ROUTE OPTIONS

2. EXISTING CONDITIONS

2.1 ROADS

The potential routes being studied all involve use of existing roads of various width and condition as summarised in Appendix B. These note the stage length, width of road between kerb, grade, condition of road, services within the roadway and information on traffic and bus services. An overview of the various items is presented in the following sections of this chapter.

2.1.1 Road Conditions

Roads throughout the route are of variable width and condition with most sections being asphalt over concrete but with some sections of exposed concrete and others asphalt over gravel.

Link 1 features road widths down to 12 metres although the majority is 12.5 m or wider.

Much of the link is suspected of having a concrete pavement under asphalt overlay as transverse and longitudinal cracking in the asphalt are suggestive of reflective cracks from concrete jointing. Between Tasma Street and Warwick Street longitudinal cracks either side of the centreline are suggestive of possible influence of the original tram route, possibly from concrete jointing. Reports from Council officers suggest that any concrete road sections are typically 250 mm thick over very poor sub base. Asphalt sections are often overlain over very poor rubble base.

The pavement condition south of Brisbane Street is noticeably worse than the northern end probably due to poorer sub grade conditions reported by Council in this area.

Link 2a transverses the Mall and the new bus terminal between Collins and Macquarie Streets. These feature concrete block pavement over the original asphalt and possibly concrete pavements.

South of Macquarie the route joins with Morrison Street and follows this around to Castray Esplanade and a terminus outside Princess No. 1 Shed. Morrison is definitely concrete overlain with asphalt up to Castray Esplanade. Castray Esplanade is exposed concrete.

Link 2b follows Liverpool Street into Murray before joining Morrison Street. The return loop is up Argyle and into Murray.

Liverpool Street is believed to feature concrete base over poor sub grade. Murray Street between Liverpool and Collins is exposed concrete in reasonable condition but is to be reconstructed by Council in 1995/1996. This section between Collins and Macquarie is asphalt in good condition and may have been reconstructed relatively recently.

Between Macquarie and Davey the road definitely has a concrete base and existing tram tracks are visible in sections of exposed concrete on the Murray/Davey Street intersection. Between Davey and Morrison Street the road is asphalt in good condition.

Returning up Argyle Street the road seems likely to feature a concrete base except for the section between Macquarie and Collins where asphalt in good condition suggests recent reconstruction.

Turning into Liverpool Street up to Elizabeth Street the road in relatively poor condition with evidence of reflective cracking suggesting underlying concrete.

2.1.2 Issues Arising

The concrete road bases pose a degree of difficulty in installation of new rails. Firstly cutting of concrete is relatively expensive but more importantly the integrity of concrete base may be comprised by addition of joints in certain locations. Where rails already exist in concrete bases, or where the bases have been designed to suit rails which have subsequently been moved, new rails should probably be located close to the original location in order to match original joint locations and features in original concrete work. Budget costing should allow for a reasonable degree of difficulty in all rail construction

2.1.3 Services

As would be expected the inner city streets feature a range of underground services including sewer, stormwater water supply and telecom lines. Sewer and stormwater mains are typically concrete with water mains being ductile iron.

Link 1 features a significant 900 mm diameter stormwater pipe along the road centreline between Federal and Lefroy Streets, and a sewer line slightly offset from centre all the way from Burnett to Brisbane Street with numerous lateral connection branches. A major 1800 mm diameter concrete stormwater drain runs up the centre of Elizabeth Street from Melville Street to the Mall.

Link 2a is relatively clear of major longitudinal services in Elizabeth Street. A 150 mm diameter sewer runs in the southern side of the centreline of Morrison Street between Elizabeth and Murray, the remaining route being clear.

Link 2b features a 450 mm diameter sewer down the centre with numerous lateral connections. Murray Street is relatively clear although the Murray/Davey intersection features a complex connection of sewer and stormwater drains including possible old brick lined sections. Argyle Street features a 450 mm diameter sewer centrally located between Davey Street and Liverpool Street.

Telecom have services throughout the city. The Telecom exchange is situated in Bathurst Street between Murray Street and Elizabeth Street. This exchange has the majority of the cables which feed the city and the rest of the suburbs. All of Telecom's cables are underground. Typically, the average cover of these cables are approximately 600 mm. All the cables are placed in 100 mm diameter conduits. On average, there would be about 3 to 5 cables situated in each of these conduits. Not all conduits have cables present in them. Telecom have placed all of their conduits either, under the far left or the far right hand side of the road, or under the footpaths.

Some of the conduits are concrete encased. There are definitely no conduits running beneath the centre-line of the road. However, at road intersections, Telecom conduit crossings are present.

Of importance would be the cables which are lead coated. With an electric tramway, small stray electrical currents could develop in metallic services. This could lead to corrosion problems with the lead coated cables. Telecom have not used lead coated cables for thirty years, however, approximately 50% of the cables on the Hobart CBD would be lead coated cables.

A summary of the conduits running beneath the footpaths and/or far left and far right hand side of roads, given in Appendix C.

The region of Elizabeth street near the exchange (ie. intersection of Bathurst Street and Elizabeth Street), is of importance. Moving up Elizabeth Street from the exchange towards Federal Street, there are 20 x 100 mm diameter conduits on the left hand side footpath, which are concrete encased. After Tasma Street, there is a road crossing and the main feed goes to the right hand side footpath. From Burnett to Federal Street, the number of conduits drops to eight. At the intersection of Elizabeth/Bathurst Streets there are 20 x 100 mm diameter conduits concrete encased crossing Elizabeth Street.

Moving down Elizabeth from the exchange towards the wharf, there are initially 10 conduits underneath the footpaths.

Moving down Murray Street from Liverpool to Morrison Street, there are on average two to three conduits running underneath the right hand side footpath. In Morrison street, after Murray Street at the proposed end of the tramway, there are none of very minor cables present. In Argyle Street, from Morrison to Liverpool Street there are a few conduits present.

To find out exactly the nature of the cables present on Hobart CDB, there would have to be pit inspections along the proposed routes. These inspections would eventually be required. However, at this stage of the project (ie. feasibility study of Tramway System), the information already obtain is adequate.

In summary there are numerous services beneath the roads reviewed for potential tram routes, in many cases directly beneath likely tracks. However this is not considered to pose undue influence of the viability of the rail laying.

A more detailed review of Council records at the stage of detailed design with physical inspection of affected services would be appropriate to access the need for maintenance. This could be programmed to coincide with rail laying.

The potential for increased corrosion of metal services due to stray currents generated by the tram services has been raised as an issue. This is likely to be a consideration only for metal pipes of which water supply mains and lead coated telecom cables are the only services involved. With a low frequency and low speed tourist type service problems will be minimal.

2.2 LAND USE AND BUILDINGS

The preferred route is divided into a number of sections.

1. Elizabeth Street: North Hobart to Liverpool

Elizabeth Street is part of the original road out of Hobart, the road to the interior and later the road to Launceston

1a North Hobart strip: Federal Street to Burnett Street

A city life environment commonly compared to Lygon Street Melbourne. This is an area of restaurants and long hours grocery shops, a food place. The centre is changing from general shopping centre to a specialist eating area, the surrounding area is being gentrified. There is a strong urban form with 2 storey shops built to the boundary and a discontinuous canopy. Strong curves at either end of the strip give the road here a particular charm. The strip is strongly defined by the Palfreymans building at Burnett Street and the landmark post office at the opposite end. Business appears brisk although vacant shops can stay vacant for a period and there is a regular change of restaurants.

Tourists don't often find North Hobart and the area's of businesses do stand to benefit from the tram.

A project *Elizabeth Street Streetworks* is currently being developed, this is exploring the implications of the *North Hobart Townscape Project Report.* That report proposed a central median strip through the strip. Such a median strip would need to be carefully detailed to ensure it was compatible with requirements for trams. It is essential to ensure it was compatible with requirements for trams. It is essential to ensure that any proposed works would not cause potential safety problems including likelihood of human error by passengers, tram drivers and vehicle drivers because of changing location of pick-up points or even changing sides of the tram.

Design Implications

- Turning into Federal Street for the proposed terminus could require poles, otherwise taller buildings could support wall mounted supports.
- Ensure any streetworks are compatible with the safety requirements of a tram system.

1b Burnett Street to Brisbane

Above the CBD Elizabeth Street has a shabby look although that is slowly changing as new businesses move into the area .

As one moves North out of the city centre shops become more rundown. There are proportionately more warehouses, institutions and caryards. Elizabeth Matriculation College occupies the Warwick Street corner and the Salvation Army occupy another large site.

Recently established businesses tend to be based on people arriving by car, selling computer hardware, buildings offices, printing equipment, pianos. Adjacent areas are of this type of dispersed warehouse, wholesaler, institutional character.

The older shops are tall and built to the street edge with verandahs. There are a number of terrace-like runs of such shops. It seems they were intended to attract the attention of passing pedestrians, typically they are no underutilised with top floors which appear empty. These older shops tend to be in poor repair, whereas modern structures are relatively well maintained.

A more recent trend has seen new restaurants and food suppliers extending the range of services beyond that previously offered by the existing takeaways. There include: the Lodge (restaurant and accommodation), Kaos cafe and Mundys 7 days a week butcher specialising in oven-ready prepared meat . This area is enjoying a gentle and fragile re-enervation.

This stretch does seem to be one that could benefit from a revitalisation of street life and while that is happening slowly the tram might accelerate the fledgling revival.

The road swings down towards the City Centre at Warwick Street and it is from here that passenger travelling South first sees the River Derwent and the Eastern Shore glimpsed over the trees in the Elizabeth Street Mall.

Design Implications

- Discontinuous verandahs, long stretches without verandahs or taller buildings, may require poles.

- Views to the South to the Derwent would be best appreciated from a height such as that afforded by an open top deck. If a half covered top deck configuration is adopted for the tram it should travel in a direction which keeps the uncovered section to the South on the Elizabeth Street stretch.

1c Brisbane Street to Liverpool Street

As one moves towards the city centre the footpath is busier, some buildings are generally presented with some notable exceptions and there are fewer vacancies. There are more continuous verandahs and taller buildings.

Above the shop's verandahs, buildings are in poor repair however, the older origins of the buildings, often patched up Georgian, and their chaotic mix, and their often eccentric decoration including a floating FJ Holden.

An exception is the open air carpark frontage, extending for half a block between Melville Street and Brisbane Street on the east. This has been suggested as an alternative site for the tram depot. It is centrally located which is an advantage for the power supply to the system and the site is council owned.

Design implications

- Taller buildings more easily allow wall mounted supports for the tram wires.

- The Melville/Brisbane Street site is an exciting one with grade changes that could allow the height required for a depot to be accommodated. In any event council's design guidelines for the site could include supporting tram lines in an innovative and exciting way.

FIGURE 2.1: LOOKING DOWN ELIZABETH STREET

2. Liverpool and Murray to Collins

This section of Liverpool is currently being reconstructed as the first part of the streetscape component of the *Hobart Centre Focus* strategy. Footpaths are being widened and outdoor seats and other furnishings introduced. These have been detailed to have a restrained resonance with Hobart's history particularly the Georgian period. Paved bulb areas protruding across the parking lane are protected from traffic by a low balustrade on a plinth.

A tram passing through the street seems entirely compatible with the Council's intentions to using character to counter the convenience of closed mall suburban shopping centres and to discourage through traffic from using CBD streets.

Design Implications

- The *Hobart Centre Focus* suite of landscaped furnishings includes a tall light standard which could be modified to carry wires is required.

2a *Liverpool*

The street features a variety of uses and buildings, large retailers such as Soundy's (Georgian above and below the verandah) and Myer (Art Deco/Modern Gothic above the verandah, contemporary fitout below), elegant modernist banks, High Victorian shoptops and Georgian shoptops.

Design Implications

- Taller buildings suggests wall mounted supports are appropriate for carrying wires.

2b Murray Street to Collins

This variety continues around the corner in Murray Street although here there are proportionately more, and more prominently located modern buildings, which may be of less interest to tourists.

Design Implications

- Taller buildings suggests supports are appropriate for carrying wires.

3. Murray Street, Collins Street to Morrison Street

This and the following two passages of the tram trip are of the most obvious interest to visitors. The tram would pass through areas where proportionately more recognisably historic buildings and places survive.

3a Collins Street to Macquarie Street

As one moves up a gentle grade the sense of being in an historic place returns. Hadleys Hotel is on the right and St Davids church on the left. The street is overhung by a large evergreen oak. There is a skew in Murray Street and the road curves down to the Cove and out of view.

Design Implications

- At this point the tram would have located so as to avoid damage to the Evergreen Oak tree which is a valued part of the streetscape, without causing traffic problems or safety problems for passengers at pick-up points.

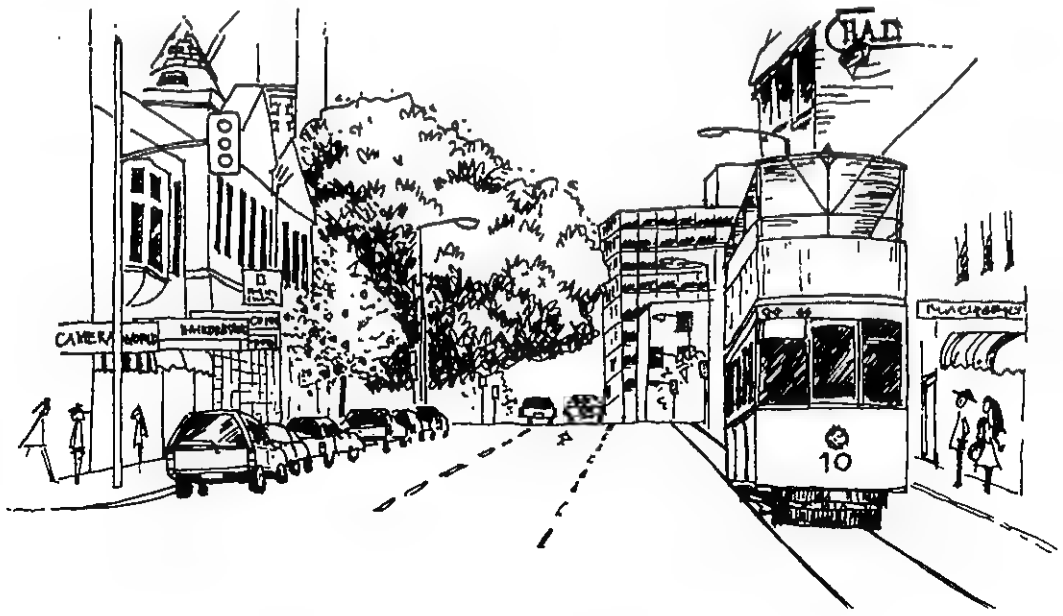


FIGURE 2.2: VIEW ALONG MURRAY STREET TOWARDS MACQUARIE STREET

3b Macquarie Street intersection

The buildings on each corner are sandstone, each is of a style and a different type. Adjoining streetscapes are relatively intact.

Design Implications

- It may not be appropriate to attach a support to sandstone which is a fairly soft stone. Any poles which are required should be discretely located and relatively low impact visually.

3c Macquarie Street to Davey

Again there is a strong historic presence, the sandstone old Treasury on one side and distinctive offices on the other including a bank with an intact banking chamber interior.

Design Implications

- It may not be appropriate to attach a support to sandstone which is a fairly soft stone. Any poles which are required should be discretely located and relatively low impact visually.

FIGURE 2.3: VIEW UP MURRAY STREET FROM SULLIVANS COVE TOWARDS CITY CENTRE

3d *Crossing Davey Street the road has a steep incline.*

For a passenger there is change in motion as the tram descends a steep incline. The water in the Cove is visible at the end of the street and more so as the tram turns past Watermans Dock. In Murray Street Georgian buildings and modern buildings contrast strongly.

The landuse in this stretch is predominantly government offices located in office towers and minor retail.

Design Implications

- Buildings are taller and relatively continuous without verandahs, wall mounted supports should be appropriate.

4. Morrison Street and Princes No. 1

4a *Morrison Street to Princes No. 1*

Morrison Street is beginning to become treelined. The tram turns past Parliament Square and across the concrete to Princes No. 1.

There are some tall buildings, no verandahs and some lower buildings.

Design Implications

- There may be a need for poles at the end of Murray Street as there are no buildings opposite and Parliament House is set back from the street.

4b *Princes No. 1*

The large waterside shed Princes No. 1 is tentatively proposed as the most appropriate depot and terminus for the tram. The tram would only occupy a small part of the shed.

Finding a use for this Princes No. 1 is proving difficult and this proposal is made while recognising that it may be altered to comply with the finally determined uses for the shed.

Princes No. 1 is located on a large paved apron.

Design implications

- At this stage the tram would arrive by the Northern entry, however, this requires detailed design resolution as the tram may be too tall to fit through the existing entrance.

- The tram line is likely to require poles, however, this would be in keeping with the utilitarian aesthetic which has been adopted in Sullivans Cove to retain the authenticity of the precinct.

4c *Morrison Street to Argyle Street*

Morrison Street links the New Wharf area of Salamanca to the Central Cove at Argyle Street.

The streetscape becomes very internal passing old flour mills and sandstone offices.

Design Implications

- The taller buildings may be appropriate for wall mounted supports, however, older buildings would need to be carefully tested to ensure there was no damage to fabric.

- The Marine Board building might also prove a problem as it has had problems with an unstable cladding.

5. Argyle Street

5a *Morrison to Macquarie*

Turning into Argyle the view opens up across Constitution and Victoria Docks to the sandstone stores flanking Hunter Street.

The tram would pass the oldest wing of the Museum and Art Gallery and the original Carnegie Library and the Town Hall. This section is likely to be of interest to passengers.

5b *Davey to Macquarie*

These blocks are less immediately interesting, particularly Collins to Liverpool which is dominated by the hospital on one side and carparks on the other and a proposed new highrise office.

The blocks are typically tall modern buildings and no verandahs.

Design Implications

- Wall mounted supports would be appropriate. In this area supports could be part of a livening up of the streetscape. Streetscape improvements in this precinct are intended to tie in with the development of Wellington Walk.

6. Liverpool to Elizabeth Street

This is a tired end of town that picks up as one moves towards Elizabeth Street. At the Argyle Street end retail is depressed by the two city block sized monolithic institutions, the hospital and the police/courts complex. A large warehouse (Websters) is underutilised, offices have been proposed.

It is not unlikely that this area might attract more viable businesses if the tram passed by. Buildings are two to three storey, older construction with some verandahs.

Design Guidelines

- Wall mounted supports may be appropriate.

North Hobart Post Office

Elizabeth Street Looking South

Elizabeth Street Looking South

FIGURE 2.4: PHOTOGRAPH SHEET

Murray street Looking South

Argyle Street on Water front

Princess No1

FIGURE 2.5: PHOTOGRAPH SHEET

2.3 TRAFFIC AND PARKING

The majority of the proposed tram route is away from high traffic roads with the northern end of Elizabeth Street and Liverpool, Murray and Argyle Streets being exceptions.

Traffic flows of 2,000 to 2,500 vehicles per hour use Elizabeth Street north of Burnett Street in peak hours. This reduces somewhat between Burnett and Warwick Streets and reduces considerably south of Warwick Street with most peak hour traffic diverting to other roads to avoid the complications of traversing the CBD block. Trams would also find some delays in passing from Elizabeth Street through Liverpool Street to Murray Street and could themselves exacerbate congestion. However, this may not be of concern to Council as Liverpool Street does not seem to be significant to through traffic.

Murray Street carries relatively heavy traffic of around 2,000 vehicles per hour between Liverpool and Davey Streets.

Morrison Street is relatively heavy at 1,500 vehicles per hour during peak hour, but traffic planing seems aimed at reducing this.

Argyle Street handles similar traffic. Other sections of the route are relatively quiet, particularly Elizabeth Street between Warwick Street and the Mall.

Most streets feature roadside parking with parking meters south of Warwick Street. A total of 260 metered parking spaces and approximately 80 unmetered but restricted time parking spaces are involved over the entire route. A kerbside tram line could conceivably affect a maximum of 50% of these spaces. A central line or a line in a traffic lane would be unlikely to affect any current parking provisions.

2.4 BUS SERVICES

The main routes are: For buses travelling North - Elizabeth and The Brooker Highway; for buses travelling East - Macquarie Street and Tasman Highway; for buses travelling West - Liverpool Street; and for buses travelling South - Davey and Regent Street and Sandy Bay Road.

On the inward journey, Northern buses use Elizabeth, Bathurst, Campbell and Davey Streets to the Bus Station in Elizabeth Street. Express buses use the Brooker Highway and Capbell Street to the Bus Station.

Buses from the West travel into the city via Collins Street.

Buses from the South use Sandy Bay Road and Macquarie Street to Elizabeth Street.

Buses to Salamanca Place are on Routes 53 and 55, and also service Battery Point and Sandy Bay.

Routes in the Hobart CBD and North Hobart region are shown in Appendix D.

The number of passengers boarding for inward and outward trips on Elizabeth Street between Federal Street down to Elizabeth Mall are:

Monday to Friday - 3,000 return trips (2,500 first boardings/balance transfers)
Saturday and Sunday - 350 return trips.

The equivalent cash fare is $1.00 per passenger in this region.

Elizabeth Street is therefore an important bus route and Metro's advice is that it will remain as such.

3. URBAN DESIGN

3.1 THE TRADITIONS OF THE PAST

When Hobart's trams were introduced they were a foresighted innovation, introduced despite opposition. Exploration of new technology and systems continued throughout the history of the system.

However the local traditions of making do and financial pragmatism were also in play. This lead to retaining useful older stock and even the cutting down and re-use of the doubledeck trams as singles (once doubles were thought to be too dangerous). A varied fleet of trams might be in service at any one time.

This suggests that any new proposal could look at a range of trams, possibly incorporating the past and the future. Supplementary facilities such as signs and shelters should be elegant timeless designs complementary to both sorts of trams.

The Hobart trams had exceptionally well crafted interiors using both European and local woods. Tasmania is currently enjoying a crafts revival. This suggests that the interior of trams provides an opportunity for both traditional and contemporary skills to be showcased.

3.2 SAFETY

Queuing, entering and leaving the tram poses major problems.

Pedestrian refuges should be provided where there is a central track, these increase the street width required. Alternatively, very clear road markings, footpath signs, a recognisable suite of furniture, colours and distinctive high intensity lighting of the general area would alert drivers and make pedestrians easier to see. This could be assisted by lighting of passenger pick up areas from the tram.

3.3 POLES AND WIRES

While it may be an intention not to have any new poles this may not be possible in areas where there are few upright structures, such as the Sullivans Cove side of Morrison Street. Tram poles could be integrated with lights or other necessary uprights.

Current technology means poles can be further apart than previously and sides of buildings can be vertical elements within an overhead system.

Supports can be visually light with arching for strength or with straight members. They should be designed to be elegant and exciting, complementary to streetscapes.

There could be a variety of pole and wire configurations including those solely dedicated to trams and multiple use poles which support lights, banners or even city decorations such as the Christmas decorations. The recently detailed CBD streetscape suite could be extended to include signature tram fixtures armatures from buildings and poles when the tram is in this precinct (Liverpool and Murray Streets)

The positive associations of the tram: excitement and adventure, links to Hobart's innovative past and to her future, should be captured in all elements associated with the tram but particularly the potentially mundane elements such as poles and wires.

3.4 SIGNAGE AND DECORATION

Signs associated with trams fall into three categories:

Necessary Information

Information signs should be immediately recognisable and quickly understood. They might be illuminated to assist night recognition. They should be placed in a location where there is little visual clutter to distract from recognition.

Consistent shape and colour and location conventions are required.

Advertising

Shelters and seats provide an opportunity for advertising. Advertising on early trams appears decorative to contemporary viewers, while reactions are mixed to the moving billboards that MTT buses have become. Areas for advertising should be confined and not overwhelm the shape of the tram.

Art

Melbourne's art trams are distinctive, distinctly Melbourne. This suggests if Hobart is to do something it should be locally distinctive, maybe specific seats and shelters could be purpose designed and fabricated by designed craft, art combinations, eg. Elizabeth Street Bus Shelters.

3.5 SHELTERS AND SEATS

Shelters

City transport shelters must provide sheltered seating with adequate sightlines out to see trams coming and good sightlines in to provide informal surveillance (lighting needs to be considered at the same time).

In Hobart shelter includes shelter from ultra-violet sun, wind and rain. In some locations protection from wind blown rain may not be possible without compromising other requirements.

Outdoor Seats

Seats need to have a straight back and armrests to suit older people who constitute a high percentage of likely users. Any surfaces people will touch should be a material with low conductivity such as wood for comfort in Summer and Winter
Dimensions should conform to ergonomic standards.

Shelters and Seats

Shelters and seats should be located to minimise obstruction of the footpath.

3.6 DEPOT

Depots can become places for people to visit and one element of a tram/transport experience. In other tramways interpretative trips throughout the depot can be an important source of revenue.

The depot may be a taller building located along the route, the size and height of this shed-like space suggests it should be integrated into another building if located in the CBD or that it may be compatible with the warehouse sheds at Sullivans Cove.

Use of part of a Sullivans Cove waterside warehouse would best suit a visitor oriented depot. A site such as Princes No. 1 would facilitate links to any future water based transport, a terminus and a display. There may be problems accommodating the height of the tram within the existing Northern entrance of the building and this could require detailed design to resolve without compromising the building's cultural (heritage) significance.

3.7 VANDALISM

The trams and all street-based support elements should be designed to withstand some vandalism. This may mean accepting that some elements will get damaged and making replacement relatively cost-efficient, using easily cleaned scratch resistant surfaces and materials.

The greatest deterrent to vandalism is good maintenance, materials should not appear old and worn, any minor vandalism should be fixed immediately as vandalism accelerates in scope.

Vandals do up to a point respect good design, the element is part of their personal life setting if it makes them feel good, or if in constant use it is less likely to be a candidate object. Brutish vandal-resistant elements often provoke the most vandalism, conversely, sporting current community art can reduce graffiti.

4. ROUTE DEVELOPMENT OPTIONS

4.1 ISSUES TO BE RESOLVED

There are a number of issues to be resolved in this study. These are dealt with in summary below and in greater detail in Appendix A.

4.1.1 Standard Versus Narrow Gauge

The original Hobart system was narrow gauge (3' 6") which is the same as the State's railways. This gauge was unique in Australia where standard gauge (4' 8½") was adopted.

The advantages of re-adopting the narrow gauge include:

- historic authenticity;
- ability to use existing cars;
- ability to use Hong Kong or possibly some European cars; and
- possible running on rail system and wharf rails.

The disadvantages include the opposite to the above, plus:

- inability to use Melbourne W Class or similar standard gauge cars;
- some (misinformed?) community concern with the safety aspects of narrow gauge.

Importantly, capital cost is not a major factor. The cost of installing tracks does not vary significantly between the gauges.

A decision on gauge must take into account whether the system will be orientated towards tourists, commuters or both. If it is the first, historic authenticity is a priority (narrow gauge). If it is the second, access to modern vehicles is desirable (standard gauge) and if it is the third, commuter requirements will prevail (standard gauge).

4.1.2 Overhead Wires Versus Substitutes

Overhead wires are an integral part of a tramway system. In the past they have had a profound impact on streetscapes but with modern technologies the density of wires can be minimised (See Swanston Walk in Melbourne).

There are alternatives to overhead wires such as power in the rails but this must be low voltage and it requires modifications to wheel systems. Cars must travel slowly with this system. Ancillary power systems such as a diesel companion car or an on-board arrangement are possible.

The advantages of overhead power are:

- efficient energy delivery; and
- historic authenticity.

The disadvantages are:

- some community concern with impact on streetscape;
- high initial capital cost (note that a transformer, rectifier and switching gear are also required)

It could be argued that a tramway system without overhead power delivery is not a tramway system at all and represents a corruption of the whole concept.

Leaving this aspect aside, a decision on this issue will turn on a financial analysis - does the investment in overhead power delivery vis a vis substitutes provide a desirable return? (It could be that substitutes are necessary as an interim measure).

4.1.3 Routes

The routes selected for evaluation are designed to meet the terms of the study brief. Link 1 (Nth Hobart P.O. to The Mall) can be dealt with in a number of ways.

The first option is a single track in the middle of the road. This has the advantage of lowest cost but the road is not wide enough to create a segregated reserve and still retain parking (It is assumed that most kerbside parking must be retained due to the nature of abutting commercial land uses). Cars would be travelling at least half in the path of oncoming traffic in both directions, and this is considered to be unsafe.

The second option is a kerbside track with parking displaced outwards. There would be conflicts with pedestrians accessing cars and this too is considered to be unsafe.

The third option is a double track, which is operationally sound as cars will travel in the same flow as motor vehicles. Of course this doubles the cost of track installation. A possible variation is three tracks where the middle rail is used for both up and down journeys. This is feasible but it is an untried approach. Tram cars would still be partially to the right of the centre of the road. It appears that a double track is the only operationally realistic option for Link 1.

Link 2a continues Link 1 to the Waterfront and to Salamanca Place. A single track could be installed in The Mall and through the Bus Depot. From there on the roads are wide enough for a segregated reserve so a single track can suffice.

Link 2b assumes a tram cannot traverse The Mall. It provides an extension to the waterfront and Salamanca Place via a one-way couplet in Murray and Argyle Streets. This enables travel with the traffic flow. As a tourist route it gives the CBD better coverage.

Although Link 1 is the stated priority in the brief there is a major advantage to be had in continuing to Salamanca Place. Tourist usage will be considerably enhanced if the service is visible in this location. The service would benefit the CBD greatly from a tourism point of view and to some extent it would break down the pedestrian barrier created by the Macquarie Street/Davey Street couplet.

Of course Link 2b is considerably more expensive in terms of both trackwork and overheads than Link 2a (through The Mall).

4.1.4 Commuter Versus Tourist Orientation

This question has already been raised in relation to route and technology options. A tourist orientated service can be relatively low key. It is an advantage to travel slowly and tourists will trade off comfort for historic authenticity. Such services are less capital intensive, but fares can be higher than commuter services.

On the other hand, commuter services must be relatively rapid to attract patronage, fares must be modest and there must be a reasonable level of comfort. This is the case because of competing modes. To achieve these ends the commuter service becomes relatively capital intensive, for example:

- tracks must be designed for heavier vehicles, higher speeds and greater frequency;
- vehicles must be more modern;
- route infrastructure must be enhanced - particularly traffic signals.

These alternative approaches are not mutually exclusive. A commuter service will attract some tourist patronage and a tourist service may attract some commuters depending on ticketing systems.

However, it should be noted that a tramway operating as commuter service is selling '*transport*', that is, it is offering in return for a fare to:

- take the client from point A to point B;
- provide a level of comfort and security; and
- undertake the trip in a reasonable time.

In this schema it is assumed that the client can present him or herself at point A and he/she can then access the desired destination from point B.

Modes of transport operate in a competitive environment. The client may take a car if one is available, and because the marginal cost of using a car once it is purchased is perceived to be small the client may even endure a longer travel time than a tram. It must be noted that the marginal cost to the client of using a car is less than the marginal cost to the community, notably because of '*externalities*' such as pollution and congestion costs.

Alternatively, the client may use a bus, cycle or walk. The important implication is that with the alternatives available a '*rational*' client will not pay more to use a tram than the cheapest transport that delivers the same service.

The most relevant alternative mode to trams is buses and the most important consideration is that the marginal cost of running a bus is low due to the fact that the route infrastructure exists in any event (ie. the road network).

It is arguable that trams provide a higher level of service than buses and this influences cities where tram networks have survived to now favour maintaining them in service.

However, where a complete new system is required the capital investment is difficult to justify if only bus fare levels of revenue are relied upon. Bus fares do not even cover the recurrent costs of providing the service in most cases.

Therefore, it is essential that tram or light trail services replace buses, rather than run in competition with them, and this is only able to be justified on long line-haul routes.

For these reasons the tramway service envisaged in the brief is deemed to be primarily a tourist service. This is not to say that it cannot serve to instil a rail-based transit mentality in Hobart and to assist in developing expertise for the future.

5. PATRONAGE AND REVENUES

5.1 VISITORS TO HOBART

This section draws heavily on work done for the Sullivans Cove Marketing and Development Strategy (1993).

5.1.1 Emerging Trends and Strategies in Tasmanian Tourism

There is considerable evidence that culturally-driven tourism is rapidly growing. Much of this evidence is quoted in Zeppel and Hall (1991):

* Visitor attendance at historic sites in the USA had a 25% to 30% growth per year during 1982 - 1984;

* Historic and cultural attractions accounted for 29% of Canadian tourism spending in the early 1970's;

* The 1986 (Australian) International Visitor Survey showed that 29% of overseas tourists visited museums and art galleries, 19% visited outdoor folk museums or historic parks and 16% attended live theatre and music performances;

* Cultural expeditions are the second most popular type of advertised special interest travel (after outdoor adventure activities).

Zeppel and Hall (1991) also refer to surveys of the socio-economic profile of cultural tourists. Generally this group is referred to as *'up-scale'*, comprising largely individuals who are professionals or managers with college or graduate school education who earn higher than average incomes. Such a profile may be indicative of the long term growth potential of this tourism sector.

Domicelj (1992) concludes that *"cultural aspects of tourism are increasing. Reasons include higher level of education, growth in special interest tours, a change towards short breaks for cultural attractions and dissatisfaction with the bland international culture of resort-based tourism"*.

Tasmania caters primarily for the domestic (Australian) tourism market with over 90% of visitors residing on the mainland. New trends are emerging in the composition of the tourists visiting the state. These trends are reflective of changes occurring in tourism both internationally and nationally and are directly related to the wants of the more affluent, and the nature of the holidays sought.

Increasingly, visitors to Tasmania are those seeking a unique holiday experience as opposed to the traditional type of holiday based on visits to see friends and relatives.

In the document titled "The Implications of the Emerging Market for Tasmanian Tourism", published by the Department of Tourism, Sport and Recreation in 1990, the following market segments were identified:

"

(a) *The Indulger - a trend setter; individualistic but passive, stylish and food and wine conscious; environmentally aware, inner-directed, well educated and free-spending.*

(b) *The Pioneer - also a trend setter; individualistic and active avoiding "commercial" ventures; committed conservationists and environmentalists, also well educated and free-spending.*

Since these two segments are the same in their general attitudes ie. authenticity, pragmatism and commitment to conservation and the environment, they can be grouped together under the banner of the "Discerning Independent Traveller".

(c) *The Enthusiast - an active, party-lover, high energy, high experiential, free spender; tends to be younger and enjoys travelling in groups. They are also the biggest gamblers.*

(d) *The Big Spender - older, passive and status conscious; lovers of luxury and free-spending. Tend to be acquisitive and materialistic.*

(e) *The Aussie - older, active pioneers, patriotic; group and family travellers; cautious spenders and sporting enthusiasts.*

(f) *The Conservative - older; passive, home-bound; somewhat lacking in confidence.*

(g) *Backpackers - young, very energetic with strong environmental commitment; cautious spenders; value seekers."*

The tourism products sought by these segments are summarised as the:

- Indulgent Holiday (47%)
- Experience Natural Australia Holiday (30%)
- Energy Plus Holiday (16%)
- Conservative Holiday (7%)

"The "Indulgent" Holiday

- *Increasing strongly*
- *Characterised by superb food, wine and service in a secluded but stimulating environment. A sense of being pampered.*
- *Most popular with Indulgers and Big Spenders*

The "Experience Natural Australia" Holiday

- *Increasing strongly*
- *Characterised by a sense of authenticity and getting close to Australia's unique environment even at a cost of some discomfort.*
- *Most popular with Discerning Independent Travellers and Aussies.*

The "Energy Plus" Holiday

- *Decreasing*
- *Characterised by an intensity of experiences and activities always involving other people.*
- *Most popular with Enthusiasts.*

The "Conservative" Holiday

- *Decreasing*
- *Characterised by safe, hassle-free, pre-planned and familiar activities with friends and relatives.*
- *Most popular with Conservatives."*

The Discerning Independent Travellers prefer unique forms of accommodation, local foods and wines, natural environments, culture, authenticity, self-improvement, knowledge etc.

Tasmania is considered to be important in terms of catering to the three main types of leisure period; the *'Big Holiday'* (major holiday expense), the *'Trip'* (specific purpose visit for example for business purposes), and the *'Break'* (short getaway) (Department of Tourism, Sport and Recreation 1990).

International tourism is playing an increasing role in Australia's tourist industry with significant growth occurring. Australia is increasingly being seen as a popular tourist destination. Tasmania's market share of tourism and rates of growth is, however, below its share of the Australian population and this represents a loss of potential income. This may mean the market offerings are out of line with the needs and desires of the new types of tourists (Finney, Crossley, Colebach, 1992). Alternatively, it may mean that relative isolation (or perceived isolation) is a factor.

5.1.2 Characteristics of Demand

The 1991 Tasmanian Visitor Survey carried out by the Department of Tourism, Sport and Recreation provides insight into the existing state of the tourist industry. Some key elements of the survey relevant to this study are:

* The total number of visitors to Tasmania increased by 38,070 visitors between 1990 and 1991, with the majority of the total visitors (66%) coming from Victoria and New South Wales.

* 44% of visitors coming to Tasmania were holidaying (ie. not visiting relatives) with 27.8% attending conferences, sporting events or other business activities.

* In 1991 78.5% of visitors arrived by air and 21.5% by sea with people preferring sea travel over time.

* Hobart is the most popular port of arrival for all visitors followed by Launceston and Devonport.

* Motor vehicles are the dominant form of transport used by visitors while in Tasmania.

* Total visitors to Tasmania were 404,670 and total spending was $398,630,000 in 1991. Per capita expenditure was $985.

* Average daily expenditure per visitor increased from $92.31 to $100 between 1990 and 1991, ie. 8.3%.

* In 1991 accommodation accounted for 34% of total expenditure with transport and *'other spending'* accounting for 21% and 45% respectively.

* The average length of stay of visitors to Greater Hobart decreased from 5.17 nights in 1990 to 4.19 in 1991.

Hobart ranks highly in terms of being a tourist destination being on the itinerary of 72% of visitors to Tasmania. In the period 1990-1991 there was an increase of 27,410 people visiting Hobart. Should this trend continue substantial tourism opportunities exist for the Cove.

Table 5.1 - Greater Hobart - Purpose of Visit (%)

	1988	1990	1991
Fly Drive Tour	33.2	20.1	18.5
School College Tour	1.0	0.9	0.8
Coach Tour	7.3	6.1	5.8
Bushwalking/rafting	3.3	3.1	3.8
Visiting friends/relatives	23.4	24.4	24.2
Other holiday	7.0	17.3	21.0
Business/Employment	15.3	14.2	14.4
Convention	5.0	7.2	6.4
Sport	2.8	3.3	2.1
Other	1.7	3.4	3.0
Total	100.0	100.0	100.0

Source: Tasmanian Visitor Survey 1991 Department of Tourism, Sport and Recreation

Table 5.2 - Spending in Greater Hobart 1991 (%)

Spending Range	Accommodation	Transport	Other	Total
0	15.8	15.4	1.7	
$1 - $100	14.4	30.3	18.3	4.5
$101 - $500	47.9	43.6	52.7	30.8
$501 - $1000	15.5	8.8	18.36	29.4
$1001 - $5000	6.4	1.9	8.8	34.8
$5000 +	0	0	0.2	0.5
Total	100.0	100.0	100.0	100.0

Source: Department of Tourism, Sport and Recreation Visitor Surveys

The spread of spending in broad terms by visitors to Hobart was fairly even. The 1990 CASP Tourism Topic Report discusses the implications of the market trends for the City Centre and Sullivans Cove. With increased numbers of tourists visiting Tasmania and Hobart it is important that future tourist development be directed to consolidate and build upon the area's competitive strengths. Market trends and implications discussed in the report of note are:

* there has been increased interest in Sullivans Cove because of its historic quality;

* there needs to be increased emphasis on smaller well located hotels (not necessarily in new construction but rather in refurbishment of existing facilities) catering for colonial, serviced apartment type accommodation;

* there is a need for backpacker accommodation;

* better retailing and eating establishments are needed and an identifiable restaurant precinct is suggested;

* enhancement of convention/meeting facilities especially for small business.

A number of possible future tourist attractions and tourist improvements, for example, an Antarctic Centre and Museum are mooted in the report along with the need for a central bus depot to service tour and coach operations and a centrally located information centre. The development of additional attractions will expand on the tourist character of the area thereby expanding its market and attractiveness.

5.1.3 Future Strategies

Strategies from the Department of Tourism Sport and Recreation Tourism Strategy '*The Implication of the Emerging Market for Tasmanian Tourism*' to achieve sustainable tourism development are summarised as follows:

- development of Tasmania's competitive strengths (natural features, historic character etc.) in line with the market demands of the growth sectors;

- giving priority to developing accommodation to meet the needs of the '*Discerning Independent Travellers*' ie. small scale hotels and secluded retreats. (Over capitalisation has occurred in the past particularly in terms of some forms of accommodation ie. those aimed at a declining market.);

- recognising that although large-scale 5 star hotels do to an extent create their own markets, the demand in Tasmania is not likely to be large and any application of considerable resources to such facilities should be examined carefully;

- Attractions and activities based on unique Tasmanian characteristics should form the main thrust of a sustainable development strategy;

- government has a special responsibility as a land owner and as an important part of the development approvals process.

Other issues raised in the report worthy of note are:

- there should be an emphasis on local, as opposed to multinational, investment because of the increased likelihood of profits being reinvested in the State economy;

- tourism strategies ought to encourage a regional as opposed to touring focus in an effort to increase the length of stays and therefore expenditure levels;

- replacement of the Abel Tasman with another ferry could have major implications for Tasmania.

5.1.4 Attractions and Cove Facilities

Visitor attractions are concentrated near the waterfront and there is a scattering of attractions in the CBD including historic buildings precincts, waterfront activities, museums and galleries, State Library, theatres and other places in interest.

Salamanca Place with its associated market in the Cove area is one of Hobart's premier tourist attractions. Other attractions in the Cove include Battery Point, Post Office Museum, Salamanca Place Gallery, Long Gallery and the Peacock Theatre, Terrapin puppet theatre, the Despard Street Gallery, Constitution Dock, Hunter Street and the Tasmanian Museum and Art Gallery.

Attractions in the CBD tend mainly to be along the lines of theatrical venues.

Tourist-orientated shopping focuses on Salamanca Place, and restaurants are dispersed through the CBD and to a lesser extent the Cove.

The CASP Tourism Topic Report states that 2,024 or 45% of visitor rooms in the Hobart metropolitan area are located in the Central and Cove areas. *'Top of the range'* accommodation is generally found within the Central Area and note is made about the existence of five star accommodation at Wrest Point. Accommodation in the study area includes new facilities such as the Sheraton Hotel and the Salamanca Inn. The report notes that there is a lack of middle range *'pub'* based and backpackers accommodation facilities.

5.1.5 Conferences

One potential tourist growth area is that relating to conventions. The Tasmanian Convention Bureau states that for every 100 delegates attending a conference and staying three nights approximately $150,000 will be injected into the local economy. In order to encourage conventions during the off-peak season the Tasmanian Convention Bureau offers a subsidy of $25 for 20 or more delegates booked for conferences between May-September 1991-1995.

Indicative estimates based on a July 1992 publication of the Tasmanian Convention Bureau indicate the following in terms of the conventions and attendance numbers:

Table 5.3 - Hobart Conventions

Time Period	No. of Conventions booked for Hobart	No. of Persons Expected to attend
1993	61	21,210 delegates
1994	62	29,980 delegates*

* Difference in delegate numbers possibility due to overestimation of facility requirements due to long term bookings.

Source: Complied by Spiller Gibbins Swan Pty Ltd from the Tasmanian Convention Bureau Members Convention Market Directory

Bookings show that the Wrest Point Convention Centre is the most popular venue followed generally by Westside Hotel, Jane Franklin Hall and the Sheraton with the Hobart Town Hall being used for public exhibitions. Of these venues the Town Hall is located within the study area. Only moderate usage of other conference facilities located in the Cove is made.

The conference market is one that has good potential with delegates purchasing locally made souvenirs, seeing the sights and using facilities such as accommodation and eating venues.

5.1.6 The Future Demand for Facilities

The Department of Tourism, Recreation and Sport has prepared projections on the number of tourists expected to visit Tasmania between 1994 and 2000.

Table 5.4 - Future Tourist Spending 1994 - 2000

	1994	1995	1996	1997	1998	1999	2000
Australian Visitors	400,000	430,000	440,000	385,000	400,000	455,000	480,000
International Visitors	64,800	70,000	75,600	81,600	88,000	94,000	100,000
Total	464,800	500,000	515,600	466,600	488,000	549,000	580,000
Visitors to Greater Hobart [1]	334,656	360,000	371,232	335,952	351,360	395,280	417,600
Total Spending [2]	167,330	180,000	185,620	167,980	175,680	197,640	208,800
Expenditure on:							
Accommodation	55,218	59,400	61,253	55,432	57,974	65,221	68,904
Transport	33,466	36,000	37,123	33,595	35,136	39,528	41,760
Other items	78,644	84,600	87,240	78,949	82,570	92,891	98,136

1. 72% of all visitors to Tasmania

2. Assumes a five day stay and expenditure level of $100 per day (average nights of stay for Greater Hobart and average daily expenditure levels as detailed in the Tasmania Visitor Survey 1991)

According to the Australian Bureau of Statistics retail industry statistics (1985-6) for every $3,381 of annual expenditure in the Greater Hobart area there is approximately one square metre of retail floor area provided. By applying this ratio to the above expenditure estimates an indication of possible future floorspace demand can be calculated. (It should be noted the figure for inner Hobart area is $2,477 per sq.m. and for Hobart remainder $5,248. The Greater Hobart figure of $3,381 falls slightly short of the average of the two and is therefore considered a reasonable figure to apply.)

The figures in the above table relate to the Greater Hobart area and not Hobart specifically however, it is reasonable to assume that most of the spending on *other items* would occur in Hobart because of its role in the retail hierarchy. Acknowledgment is also made of the relatively optimistic tourist number forecasts of the Department of Tourism, Recreation and Sport.

The introduction of additional attractions/facilities into the market such as an international Antarctic Centre and/or a new ferry (being an attraction in itself) may result in an increase in spending.

The Department of Roads and Transport commissioned a marketing plan examining the replacement of the *'Abel Tasman'* with the *'Peter Pan'* ferry. This facility is to become an attraction in itself containing conference and resort as well as transport facilities.

In November 1992 a report on the development of a centre using the story of the ancient super continent of Gondwana as its central theme, was published. Finney, Crossley, Colebach (1992) states there is a need for a major world class tourist attraction to be established in Hobart and recognised the Sullivans Cove/Salamanca Place area as the most appropriate destination. The centre will cater for the interests of cultural tourists. Projected attendance figures for the centre are 225,000 by 1987 increasing to 350,000 at the turn of the century.

In the event both these facilities are provided, increased levels of tourism to Tasmania are anticipated.

5.1.7 The Most Recent Data

The Department of Tourism, Sport and Recreation has supplied visitation figures for 1992. Figure 5.1 summarises the figures for Tasmania, Hobart and Salamanca.

It can be seen that 73% of visitors to Tasmania visited Salamanca. These figures highlight the importance of Salamanca as a tourist destination.

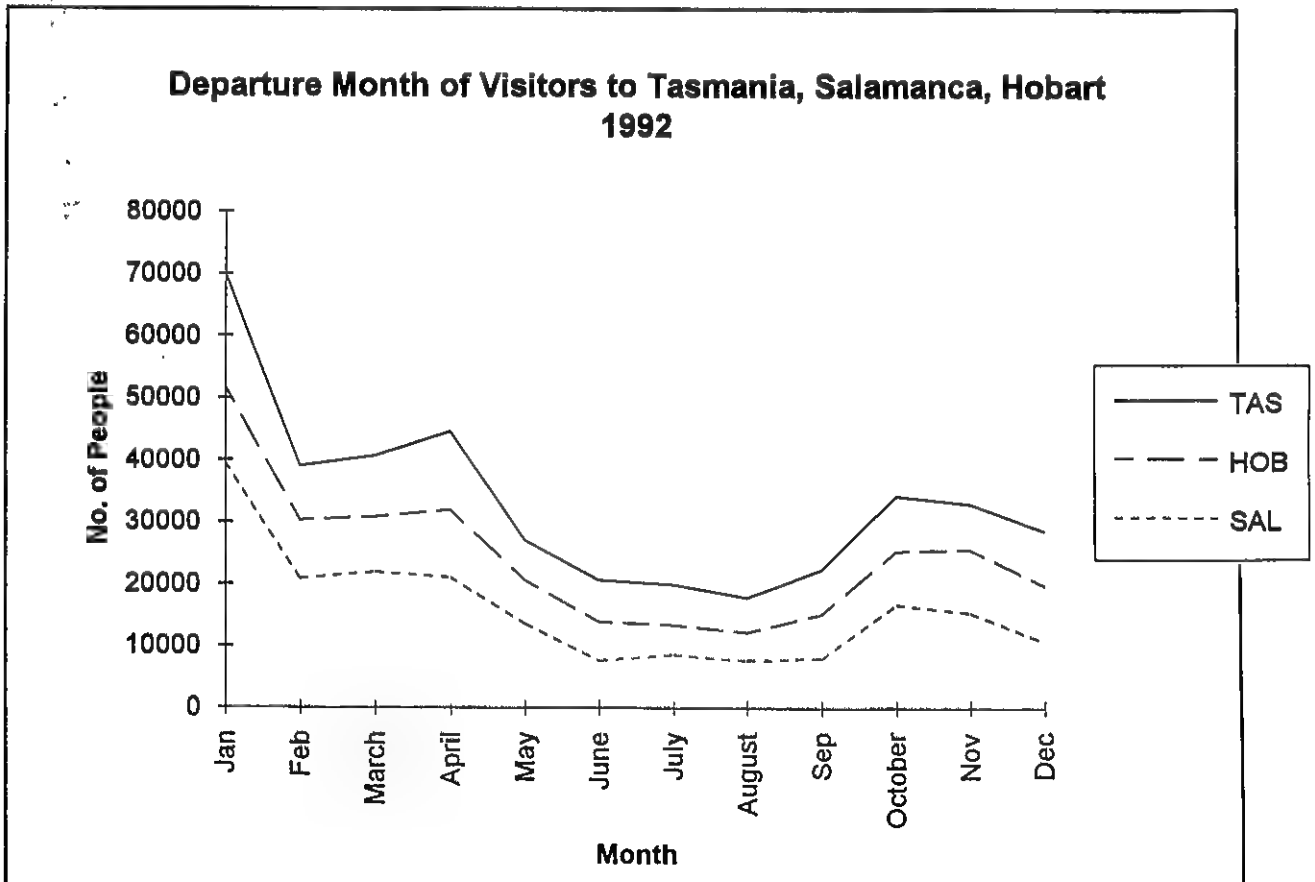


FIGURE 5.1 VISITS TO TASMANIA, HOBART AND SALAMANCA, 1992
Source: Department of Tourism, Sport and Recreation

5.2 THE LOCAL MARKET

5.2.1 Population Growth

Table 5.5 details the population changes relating to the Hobart local government are a, the Greater Hobart area and Tasmania as a whole.

Table 5.5 - Population Change And Rates Of Growth 1976 - 1990

Area	1976	% Annual Change 76-81	1981	% Annual Change 81-86	1986	% Annual Change 86-91	1991	% Annual Change 1976-1991
Hobart Local Government Area	50384	-1.0	47920	-0.24	47356	-0.11	47106	-0.45
Greater Hobart Area	162062	0.76	168359	0.79	175082	0.76	181832	0.77
Tasmania	402866	0.79	418957	0.82	436353	0.74	452836	0.78
Australia	14,033,083	1.24	14,923,260	1.43	16,018,350	1.02	16,849,796	1.23

Source: Australian Bureau of Statistics

The table reveals that Tasmania's population growth is lagging behind the national rate, and the rate of growth is declining. The rate of growth in Greater Hobart mirrors that of the State.

Municipal Hobart's rate of population growth in the 1986 - 1991 period has continued to be negative although the rate of decline is decreasing. This occurrence is typical of Australian inner urban locations.

Thus the local market is static but it is still a potential source of patronage. Importantly, in mid 1992 there were 17,272 people employed in Hobart's CBD and 8,371 in the Sullivans Cove area. The total of 25,643 represents an increase of around 3,000 persons, or 12% since 1986.

5.3 AUSTRALIAN CASE STUDIES

There are commuter tramway systems in Melbourne and Adelaide. Melbourne has a comprehensive network while Adelaide has one line to Glenelg.

Sydney is investigating a light rail in Darling Harbour and Newcastle is looking at a proposal for a disused railway line. Brisbane is undertaking a feasibility study in the Fortuna Valley.

There are historical exhibit-type trams at Bylands in NSW and at Newcastle (and in Christ church in NZ). Ballarat has an historical/tourist project and Bendigo has a more tourist-orientated system.

Of all of the above the Bendigo System is perhaps the best case study with some lessons to be learned from Ballarat. These are expanded upon below.

5.3.1 Bendigo

Bendigo is a regional centre with a population of 78,000 located approximately 130km north-west of Melbourne.

Bendigo attracted 257,000 *visits* from domestic tourists in 1991/1992, the average length of stay was 3.1 nights (Ballarat, by contrast, attracted 297,000 *visits* where the average length of stay was 3.0 nights). The wider Bendigo region attracted 8,460 international visitors in 1991, which is 0.4% of all international visitors to Australia and about 1.2% of all international visitors to Victoria (equivalent figure for the Ballarat region are 18,882, 0.9% and 2.7% respectively). Thus total visitation is in the order of 265,000 per year.

5.3.2 The Bendigo Tramway

The Bendigo Tramway is operated by the Bendigo trust who also operate the Central Deborah gold mine. The mine offers one of few opportunities for public access to an operational underground mine.

The Tramway offers joint ticket arrangements with mine tours from a well equipped information centre with parking and cafe facilities. The tour is on a *'talking tram'* which provides taped commentary over the 8 km round trip on 4km of track. A stop is made at the original depot where 31 tram cars are stored.

The Bendigo service uses infrastructure which remained from a comprehensive network. Fares are $6 for adults and $3 for children. The service runs every day with a single car at 1.5 hour intervals with extra services on holidays.

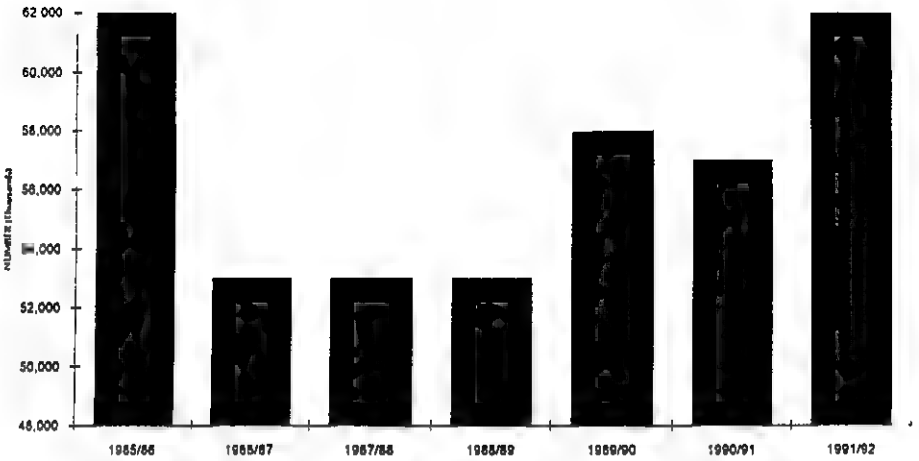
The service has received significant grants over 20 years since its inception from all levels of government and it enjoys considerable support from the City of Bendigo and from sponsors and volunteers.

In 1992/93 the Bendigo Trust's income was nearly $1.2 mil of which approximately half was derived from admissions. However, grants were received from the Federal Government for works on the Tramway Shelter. The previous year was more typical where admissions were 60% of total revenue.

The tramway has the equivalent of six full-time salaried people including two involved in track and overhead maintenance. The Trust achieves an operating surplus. Wages represent approximately 50% of all expenses. An amortisation allowance of $41,000 (2.5% straight line) was allowed in 1992/93 indicating that assets are valued at around $1.6 mil.

5.3.3 The Ballarat Tramway

Ballarat in Victoria has similar visitation levels to Bendigo. The Ballarat tramway uses 1.3 km of remnant track through gardens. The service is run by volunteers with 15 cars including a horse drawn vehicle. It runs on weekends and holidays with adult fares at $1.50 and 80c for children. In 1992/93 the service carried 17,144 passengers.



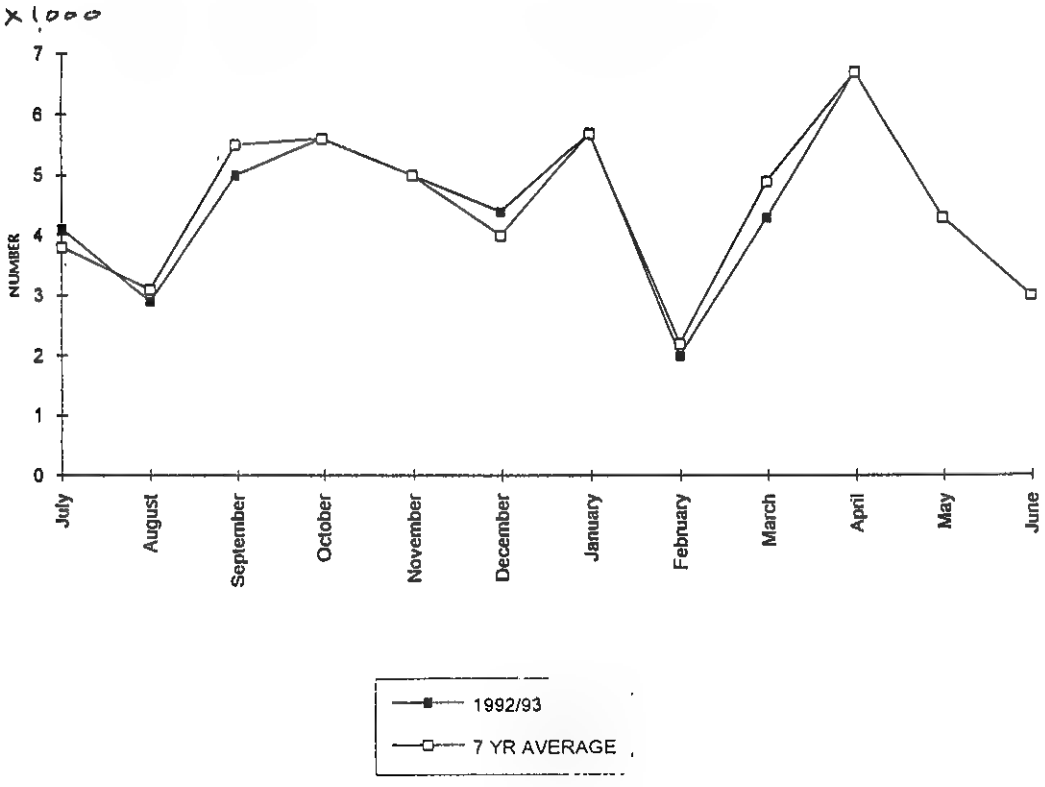


FIGURE 5.2: BENDIGO TOURIST TRAM NUMBERS
Source: The Bendigo Trust

FIGURE 5.3: BENDIGO TRAMS

The Ballarat tramway is qualitatively different to Bendigo's. It's principal objective is historical preservation. Lower patronage and fares reflect this.

If Ballarat were to expand its routes it would be catering for the same market as Bendigo.

5.3.4 Kuranda Scenic Rail

In order to verify the market penetration of rail based tourist services, figures on the Kuranda Scenic Rail service have been obtained. This service runs regularly from Cairns to Kuranda. In 1991 it attracted 276,000 trips (one way) - visitation to the region was in the order of 1,300,000 (21% capture rate).

Present fares are $20 one-way for an adult. This confirms that the Bendigo capture rate (17%) is not an aberration and if the appeal of the service is great enough fares can be quite high.

5.4 REVENUE FORECASTS

5.4.1 The Package of Attractions

Due to the similarities with the Bendigo situation the patronage of this service is adopted as a starting point. Bendigo with its visitation of 300,000 p.a. achieves 50,000 trips on its 8 km route (4km of track) with a '*package*' of attractions including:

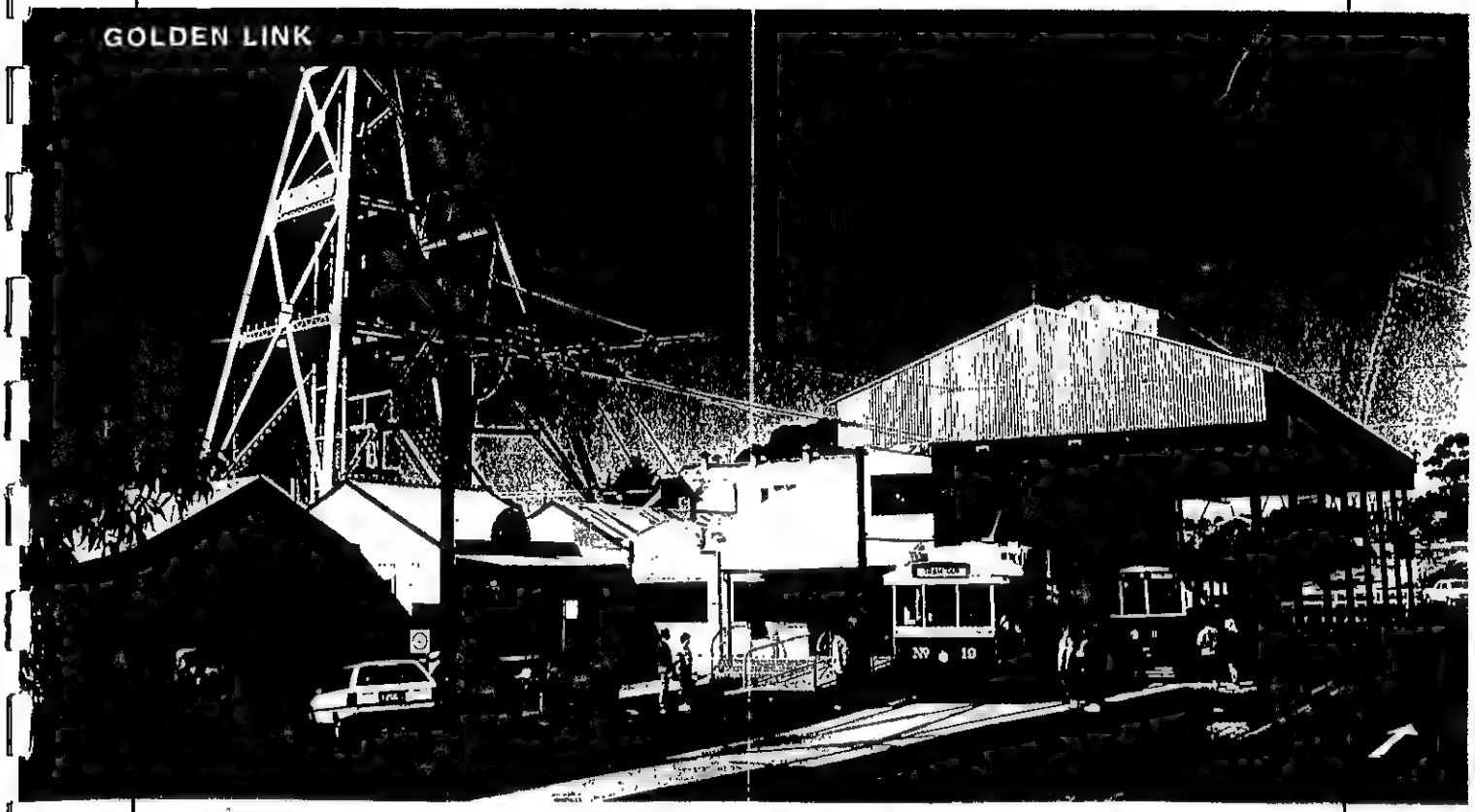
- an opportunity to tour the Central Deborah Gold Mine (at extra cost);
- route commentary (*'Talking Tram'*) ;
- depot visit; and
- comfortable base station with amenities.

The fares on the Bendigo service are $6 adult and $3 children, with the average estimated to be $4.70 (based on Ballarat data).

5.4.2 Basis for Estimate

Link 1 + 2b is closest to Bendigo. Link 1 + 2a and Link 1 are inferior products in the economic sense. Revenue items are set for Link 1 +2b and adjusted for the other stages as follows:

Fares:	Reduced patronage and ticket price
Sales:	Reduced proportional to patronage
Subscriptions:	Reduced proportional to patronage
Advertising:	Reduced proportional to route length
Donations:	Constant
In-kind:	Constant
Grant:	Constant.



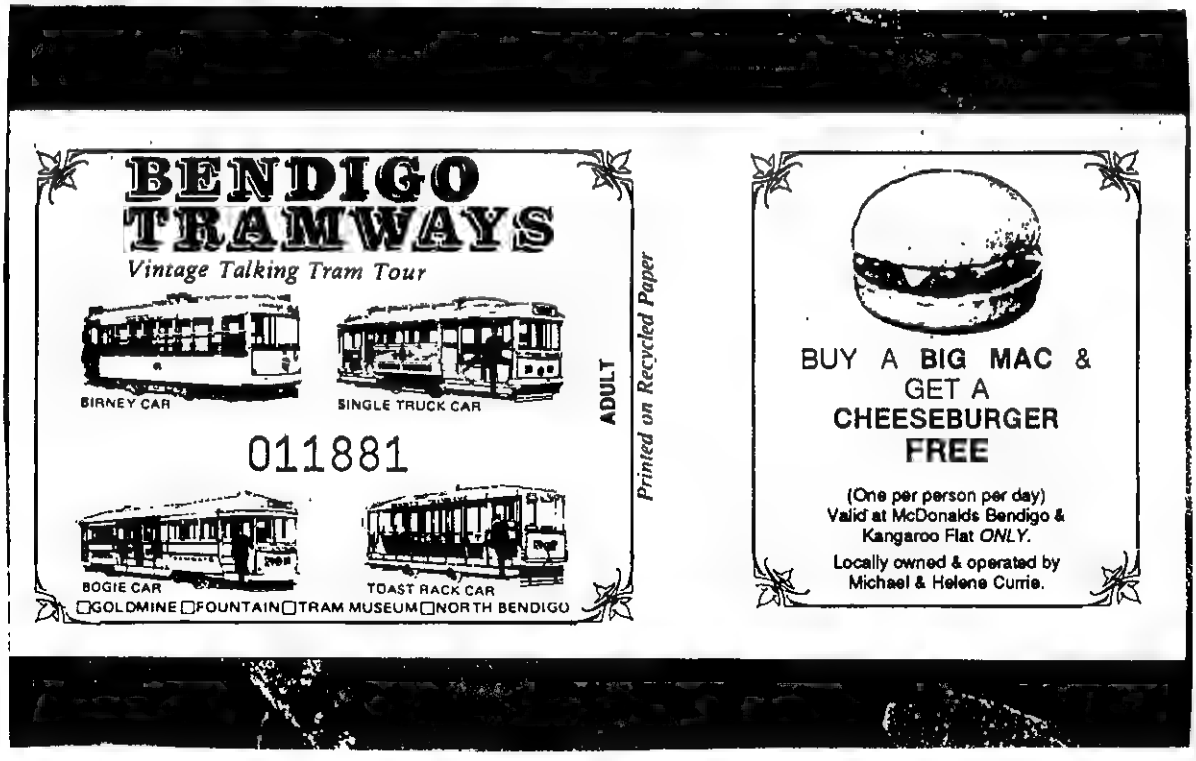


FIGURE 5.4: BENDIGO MARKETING

Gross fare revenue is therefore estimated on the following basis:

	Patronage	Average Fare	Gross Fare Revenue
Link 1	35,000	$2.50	$87,000 p.a.
Link 1 + 2a	45,000	$4.00	$180,000 p.a.
Link 1 + 2b	50,000	$4.70	$235,000 p.a.

The revenue estimates are:

Table 5.6 - Revenue Estimates

Item	Unit Revenue	Link 1 + 2b Quantity	Annual Revenue	Link 1 + 2a Quantity	Annual Revenue	Link 1 Quantity	Annual Revenue
1. Fares	235,000	1.000	235,000	0.766	180,010	0.372	87,420
2. Sales	60,000	1.000	60,000	0.900	54,000	0.700	42,000
3. Subscriptions	5,000	1.000	5,000	0.900	4,500	0.700	3,500
4. Advertising	120,000	1.000	120,000	0.670	80,400	0.390	46,800
5. Donations	30,000	1.000	30,000	1.000	30,000	1.000	30,000
6. In-kind Contributions	0	1.000	0	1.000	0	1.000	0
7. Grants	0	1.000	0	1.000	0	1.000	0
Gross Revenue			450,000		348,910		290,720

(Note: Sales, subscriptions and donations are based on the Bendigo service pro rata to fare revenue. Advertising revenue is based on advice from Banks Paton Australia Pty Ltd, the Council's marketing advisors.)

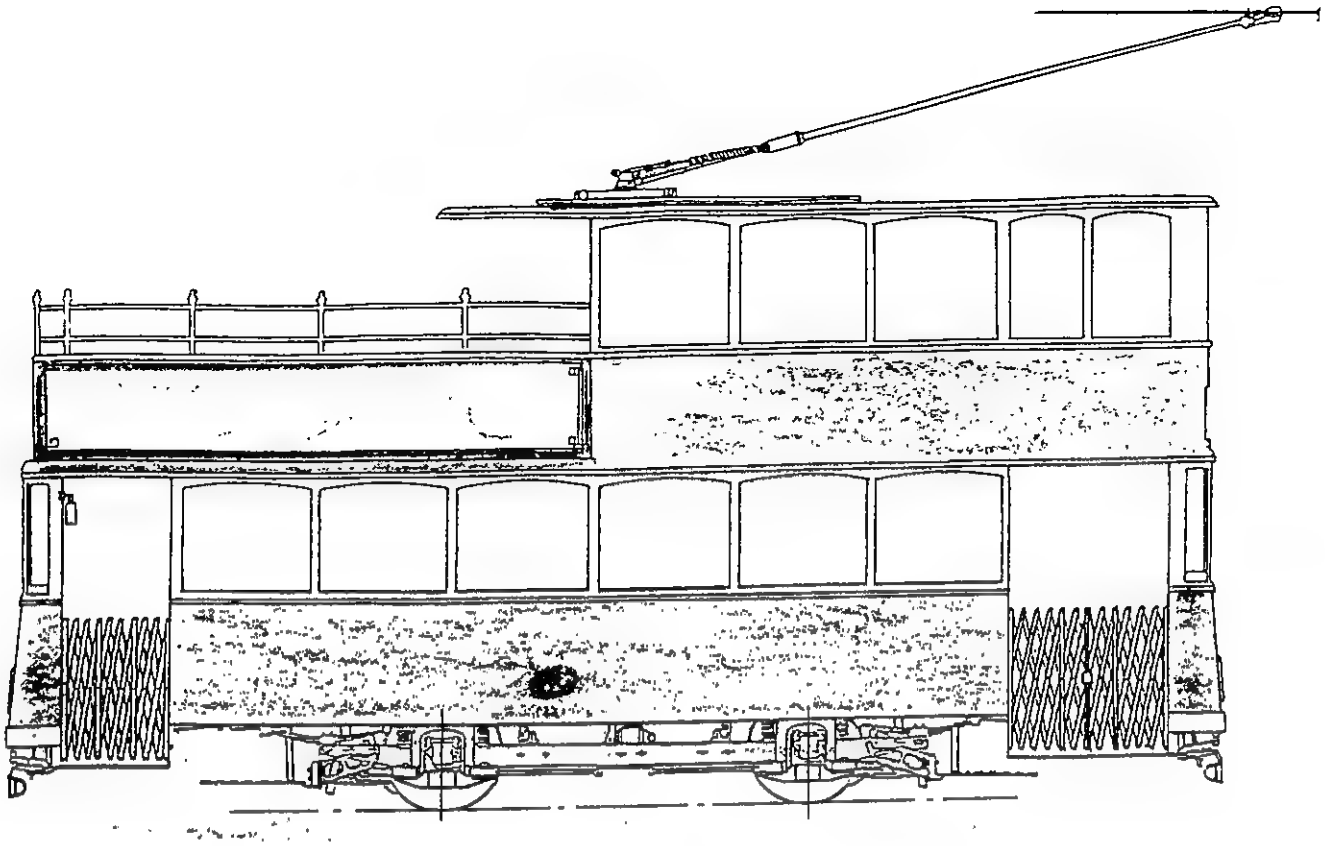
On the issue of advertising revenue the tram unquestionably offers a major opportunity for exposure. Advertising on tramcars has historical precedents. The tramcar will be featured in postcards and all manner of promotional material including films and videos. Exposure will in fact be world-wide.

Bodies such as the Hydro Electric Commission, the Forests Industries and Metro can gain significant kudos from associating with the project. Major corporations should be easy to attract and there will be a range of opportunities for small business promotion.

At this stage no assumptions are made on in-kind contributions or grants. These will be treated as residual factors in the analysis.

5.4.3 Vehicle Capacity Check

The patronage estimate enables a vehicle capacity check to be carried out to confirm the number of vehicles required. In the table below it can be seen that for the longest route (Link 1 + 2b) and for the slowest speed (10km/hr) a daily capacity of 384 is available with one vehicle.



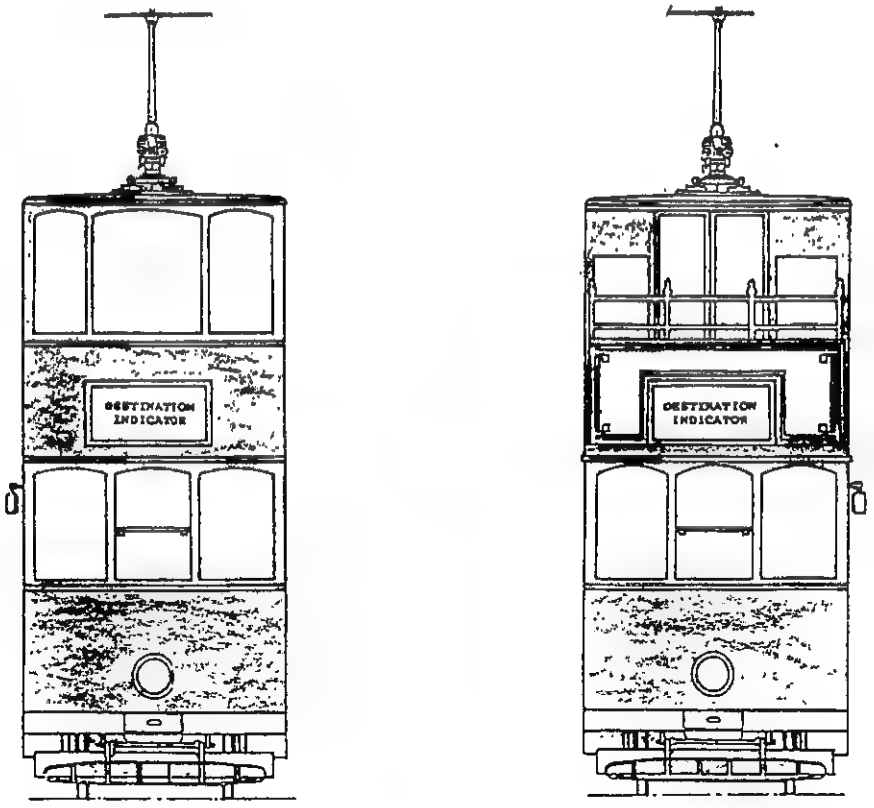


FIGURE 5.5: THE HONG KONG TRAMCAR

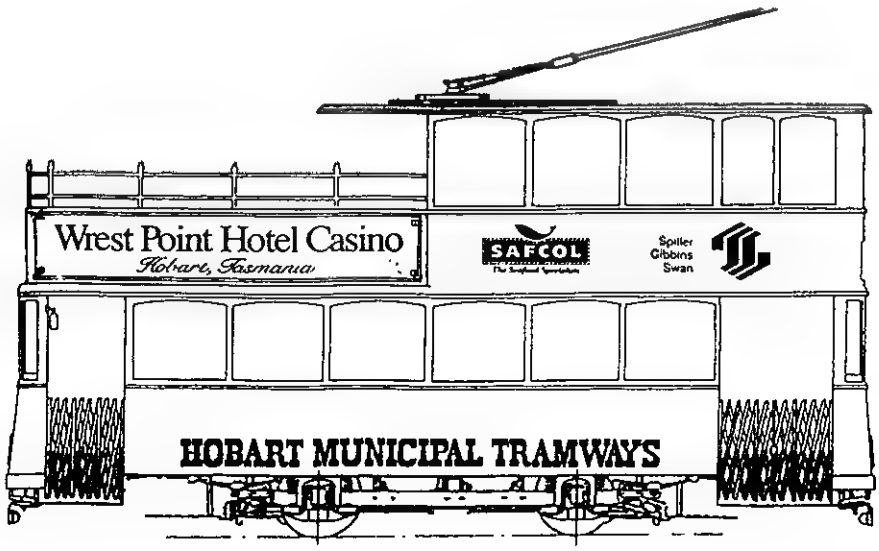
Table 5.7 - Capacity Check			
Item	**Link 1**	**Link 1 + 2a**	**Link 1 + 2b**
Route Length (Return to Point)	2.8	4.8	7.2
Journey Length			
- 10 km/hr (min)	16.8	28.8	43.2
- 15 km/hr (min)	11.2	19.2	28.8
Journeys in 8 hrs			
- 10 km/hr	29	17	11
- 15 km/hr	43	25	17
Daily (8hr) Capacity Per Car			
- 10 km/hr	1,000	583	389
- 15 km/hr (35 seats)	1,500	875	583

Bendigo tourism has a similar seasonal spread to Hobart and the busiest month sees 8,000 patrons using the tram service. This equates to 266 trips per day which is well within the 389 capacity.

Therefore, one vehicle will suffice - at least to commence the service. Acquisition of a second vehicle may be justified after monitoring the situation.

Importantly, there are alternative means of catering for peak demands. For example the Transport Museum could be licensed to run its historic trams, or Metro could run the tram it is currently restoring.

Ideas have been generated during the study for promoting winter use by converting the tramcar for dining in conjunction with local restaurants. It is quite evident that the Hobart community is keen to participate and to pursue innovations which will optimise the benefits of the service.



6. COSTS

6.1 INFRASTRUCTURE

The basis for costings is detailed in Appendix A. The unit cost estimates contained in the Appendix are applied to quantities in the table below.

Table 6.1 - Cost Estimates

Item	Unit Cost ($)	Link 1 No. of Units	Link 1 Cost ($)	Links 1 + 2a No. of Units	Links 1 + 2a Cost ($)	Links 1 + 2b No. of Units	Links 1 + 2b Cost
1 Substation	100,000	1.0	100,000	1.0	100,000	1.0	100,000
2 Single Track (km)	350,000	0.0	0	1.0	350,000	2.0	700,000
3 Double Track (km)	600,000	1.4	840,000	1.4	840,000	1.4	840,000
4 Overhead Single (km)	100,000	0.0	0	1.0	100,000	2.0	200,000
5 Overhead Double (km)	150,000	1.4	210,000	1.4	210,000	1.0	210,000
6 Workshop	250,000	1.0	250,000	1.0	250,000	1.0	250,000
7 Equipment & Jacks	130,000	1.0	130,000	1.0	130,000	1.0	130,000
8 Lifting	20,000	1.0	20,000	1.0	20,000	1.0	20,000
9 Points	10,000	2.0	20,000	2.0	20,000	3.0	30,000
10 Contingencies @ 15%			235,500		303,000		372,000
Total			**1,805,500**		**2,323,000**		**2,852,000**

(Note: The contingencies factor is designed to cover services relocation where required, line marking and other miscellaneous items)

It is important to note that once Link 1 is established there are costs (substation, workshop and equipment) which are sunk.

Adding Link 2a to Link 1 increases route length by 70% for a 30 % increase in cost. adding Link 2b to Link 1 increases route length by 157% for a 58% increase in cost.

The unit costs used are for very *basic* infrastructure suitable for low speed and low frequency tourist service. While other compromises may be made these are likely to carry with them an element of risk of failure, and they are not therefore pursued.

Risk management is a very important factor in a project such as this, particularly when it is possible there will be some detractors who will exploit an apparent failure or perceived shortcoming.

A potential major saving is achievable if an existing building can be obtained for the workshop ($250,000).

6.2 ROLLING STOCK

The recommended tramcar is a brand new double decker Hong Kong tourist tram (Appendix A). This has the advantage of proven technology and maintenance back-up. An allowance of $400,000 is made, which includes a spare truck.

Local fitout to display excellence in arts and crafts is highly recommended to maximise benefits through employment and promotion but this is not necessarily a cost saving measure, so it is not part of the financial analysis.

6.3 RUNNING COSTS

Again the details of running costs are contained in Appendix A. The estimates are:

Link 1 : $160,000 pa
Links 1 + 2a : $180,000 pa
Links 1 + 2b : $200,000 pa

There will be non-budgeted costs in various agencies, particularly during the set-up phase (eg. this study). But these represent a temporary diversion of existing resources and it is arguable that these functions are part of the respective agencies collective responsibilities.

6.4 COST SUMMARY

In summary, the cost estimates are:

Link 1:
- Double Track in Elizabeth Street - North Hobart to Liverpool Street
- Route Length 2.8 km
- Costs

  - Infrastructure $1.80m
  - Tramcar $0.40m
  - Running $0.16 p.a.

Links 1 + 2a:
- Single track in Elizabeth through Mall to Salamanca Place
- Route Length 4.8km
- Costs

  - Infrastructure $2.32m
  - Tramcar $0.40m
  - Running $0.18 p.a

Links 1 + 2b:
- One-way couplet using Murray/Argyle to Salamanca Place
- Route Length 7.2km
- Costs

  - Infrastructure $2.85m
  - Tramcar $0.40m
  - Running $0.20 p.a

6.5 OTHER COST SAVING OPPORTUNITIES

A number of possible cost saving opportunities have been suggested in the brief or during the study. Local fitout is dealt with above - another is the possibility of diesel power. Appendix A deals with this option and concludes that it detracts from the tram concept to an unacceptable degree. The patronage estimates would be thrown into doubt if the system is not the *genuine article.*

Power supply through the rails has been suggested as an alternative to overhead wires. However, this provides low power and is prohibitively costly.

Batteries have also been investigated. Metro is investigating battery and hybrid buses and this is feasible for trams. However, range is low (20 to 50 km) and recharging takes 5 to 10 hours necessitating replacement batteries at a cost of $20,000 for each bank. Replacement takes half an hour. Thus two or possible three trams would be required to maintain route capacity.

The critical factor is risk. It would be inadvisable to pursue new technologies in a system where failure destroys the whole system. New technologies are best pursued by larger systems where resources are available to correct or absorb failures.

In any event, tram systems are based on proven technology and they come as a package which is:

- rail based;
- remote energy source; and
- overhead wire delivery of energy.

All of these elements are part of the tram ethos, which is an essential component of the product that is being marketed to tourists.

A further variation is the possibility of *dolly wheels* under the tram to enable it to drive to a remote depot. There would be considerable conversion costs in this and there may be regulatory problems (compliance with Australian Design Rules).

A specially designed low-loader trailer may be a better option. This could also be used to transport the Transport Museum's trams and/or Metro's tram if they are to become involve in the future.

7. FINANCIAL ANALYSIS

7.1 APPROACH

For the purpose of this study a relatively simple financial analysis is adopted which involves entering all costs and revenues in present day values in a 20 year cash-flow analysis.

It is recognised from the start projects such as this cannot meet conventional commercial investment criteria without assistance. This is because the price people are willing to pay for recreational pursuits takes into account the availability of other facilities, some of which may be free (eg. visit to the museum or walking on the wharves).

Governments are still interested in providing such facilities as agents for the other (ie. non-user) beneficiaries. For example, businesses derive economic benefits from increased tourism. These businesses pay taxes and the Government is in a position to plough some of this resource back into economic infrastructure. In fact, because such projects invariably use other public infrastructure (eg. roads) the Government is the only body that is able to undertake them.

The question in the financial analysis therefore becomes - what amount of assistance is required? The equally important question of whether the assistance is justified is tackled in the next chapter.

7.2 METHOD

The financial analysis spreadsheets are included in Appendix E. Capital costs are entered in year 1 and running costs in years 2 to 20. Gross revenues are also entered in years 2 to 20. In all cases the net revenue is (predicatably) negative in year 1, and positive thereafter.

Various discount rates (which account for the fact that future dollars are worth less that present day dollars) are applied to yield a *present* value for the revenue stream. The difference between the initial capital costs and the present value of the revenue stream is the amount of assistance the project needs.

Note that the discount rates used below are *real* rates, that is, they exclude an inflationary component (remember that all values are entered in present day, non inflated dollars.

7.2.1 Government Project

If the public sector implements the project it requires a return commensurate with the *opportunity cost* of its capital. This is conservatively assessed to be the rate of return available on commercial money markets (say 9% real).

Of course, governments often accept a lower rate of return but for a project of this nature 9% real is an appropriate starting point. Thus 9% real is the adopted *test discount rate* for a government project.

7.2.2 Private Sector Project

In a project such as this a private developer might require a return on the following basis:

- return on capital 9%
- profit 10%
- risk allowance 6%

(all *real* rates)

Thus the overall return would be in the order of 25% real. There are means of reducing this margin that have been explored in a number of *Build-Own-Operate (BOO)* schemes where taxation advantages can reduce the required return on capital and the risk margin can be removed by guaranteeing the income stream. In theory therefore, the required return might be as low as 16% real - but relatively small-scale one-off projects such as this may be difficult to market to BOO operatives.

7.2.3 Build and Sell

A third option is for the public sector to build the project, get it running and sell it as a going concern. In many ways it makes sense for the public sector to undertake the project because it is essentially in the public domain. There are a multiplicity of agencies involved (eg. servicing authorities) which the private sector would find difficult to deal with.

In the event that a completed and proven project is offered to the market place the required return in a buoyant economy might be slightly less that it is on commercial money market. However, current commercial development yields are presently quite low. It would be better to view possible sale in future as an available option rather than as the basis of project.

Thus two discount rates area applied:

- Government Project @ 9% real
- Private Project @ 25% real

7.3 SCENARIOS TESTED

An analysis such as this necessarily requires making a range of informed assumptions. The approach has been to develop the most likely scenario with the most realistic assumptions. As discussed, this is based on the Bendigo experience.

Another scenario is to assume that revenues will increase in line with tourism growth forecasts which the Department of Tourism estimates will be in the order of 3.75% pa. At least some of this growth if not all is likely to be achieved.

On the pessimistic side, a scenario can be created where costs blow out and revenue forecasts are not fully achieved. An optimistic scenario is one where revenues are exceeded and there is future growth at 3.75% p.a.

Accordingly, the following four scenarios are tested to cover a wide range of possibilities.

Scenario 1	-	Base scenario
	-	Derived from Bendigo Situation
	-	No growth
Scenario 2	-	As per 1 but with 3.75% pa growth in total revenue.

Scenario 3	-	Pessimistic scenario
	-	Costs inflated 10%
	-	Revenues reduced 10%
Scenario 4	-	Optimistic scenario
	-	Fare revenue increased by 20%
	-	Future growth at 3.75% p.a.

7.4 RESULTS

The results of the analysis are summarised in Table 7.1. The size of the initial grant that is required is estimated in the two right hand columns; 9% for a public sector project and 25% for a private sector project.

In Scenario 1 the size of the grant required at 9% is lower for Links 1 + 2b than for 1 + 2a and 1 alone. At 25% this pattern is marginally reversed. The reason for this is that the higher discount rate has a greater impact on the future revenues vis a vis the initial capital costs of 1 + 2b, than it does on 1 + 2a or 1 alone.

This pattern is repeated in Scenarios 2, 3 and 4. The indications are that the most cost-effective solution is in fact to construct the full project, ie Links 1 + 2b, which continues to Salamanca Place. This solution provides opportunities for cost savings by using wharf sheds for a depot.

The results of Scenario 2 indicate that the extent of the initial capital grant is sensitive to assumptions on revenue growth rates. For a public project Links 1 + 2b require no grant at all if revenues increase at 3.75% p.a.

Scenario 3 is the pessimistic scenario with cost blow-outs and revenue shortfalls. The size of the capital grant doubles to $2.0mil from Scenario 1 for a public sector project.

Scenario 4 is the optimistic scenario.

On balance Scenario 1 appears reasonable because it assumes no growth in revenues which is a very conservative stance. Adopting the same patronage as Bendigo (50,000 p.a) is also very conservative because Bendigo has in fact experienced higher levels in some years. It is also possible that visitors to Hobart may have a higher propensity to use a tourist tram. These conservative assumptions may compensate for any possibility of cost blow-outs.

It is concluded that the likely initial grants required are:

- $1.0 mil for a public sector project; and
- $2.0 mil for a private sector project.

7.5 CASH FLOWS AND MANAGEMENT

It must be borne in mind that the above analysis assumes for a public sector project that the government both provides the initial capital grant of $1.0 mil and finances the balance of $2.2 mil, on which it receives a 9% real return.

SCENARIO 1 - BENDIGO EQUIVALENT / NO GROWTH

Option	Cost	Present Value of Revenues		Initial Grant Required	
		9%	25%	9%	25%
Route 1	$2,205,500	$445,000	$196,014	$1,760,500	$2,009,486
Route 1 + 2a	$2,723,000	$1,511,764	$665,903	$1,211,236	$2,057,097
Route 1 + 2b	$3,252,000	$2,237,529	$985,588	$1,014,471	$2,266,411

SCENARIO 2 - BENDIGO EQUIVALENT GROWTH
(3.75% per annum increase in revenues from year three onwards)

Option	Cost	Present Value of Revenues		Initial Grant Required	
		9%	25%	9%	25%
Route 1	$2,205,500	$998,957	$327,515	$1,206,543	$1,877,985
Route 1 + 2a	$2,723,000	$2,433,379	$884,680	$289,621	$1,838,320
Route 1 + 2b	$3,252,000	$3,426,164	$1,267,752	* $174,164	$1,984,248

(*) Denotes that no grant is required as a surplus is returned.

SCENARIO 3 - PESSIMISTIC
(All Costs +10%, All Revenues -10%)

Option	Cost	Present Value of Revenues		Initial Grant Required	
		9%	25%	9%	25%
Route 1	$2,426,050	$114,096	$50,257	$2,311,954	$2,375,793
Route 1 + 2a	$2,995,300	$1,038,383	$457,388	$1,956,917	$2,537,912
Route 1 + 2b	$3,577,200	$1,655,771	$729,335	$1,921,429	$2,847,864

SCENARIO 4 - OPTIMISTIC
(Fares +20%, Growth 3.75% p.a. for all revenues from year three onwards)

Option	Cost	Present Value of Revenues		Initial Grant Required	
		9%	25%	9%	25%
Route 1	$2,205,500	$1,201,623	$407,406	$1,003,877	$1,798,094
Route 1 + 2a	$2,723,000	$2,850,697	$1,049,187	* $127,697	$1,673,813
Route 1 + 2b	$3,252,000	$3,970,966	$1,482,513	* $718,966	$1,769,486

(*) Denotes that no grant is required as a surplus is returned.

TABLE 7.1: FINANCIAL ANALYSIS RESULTS SUMMARY

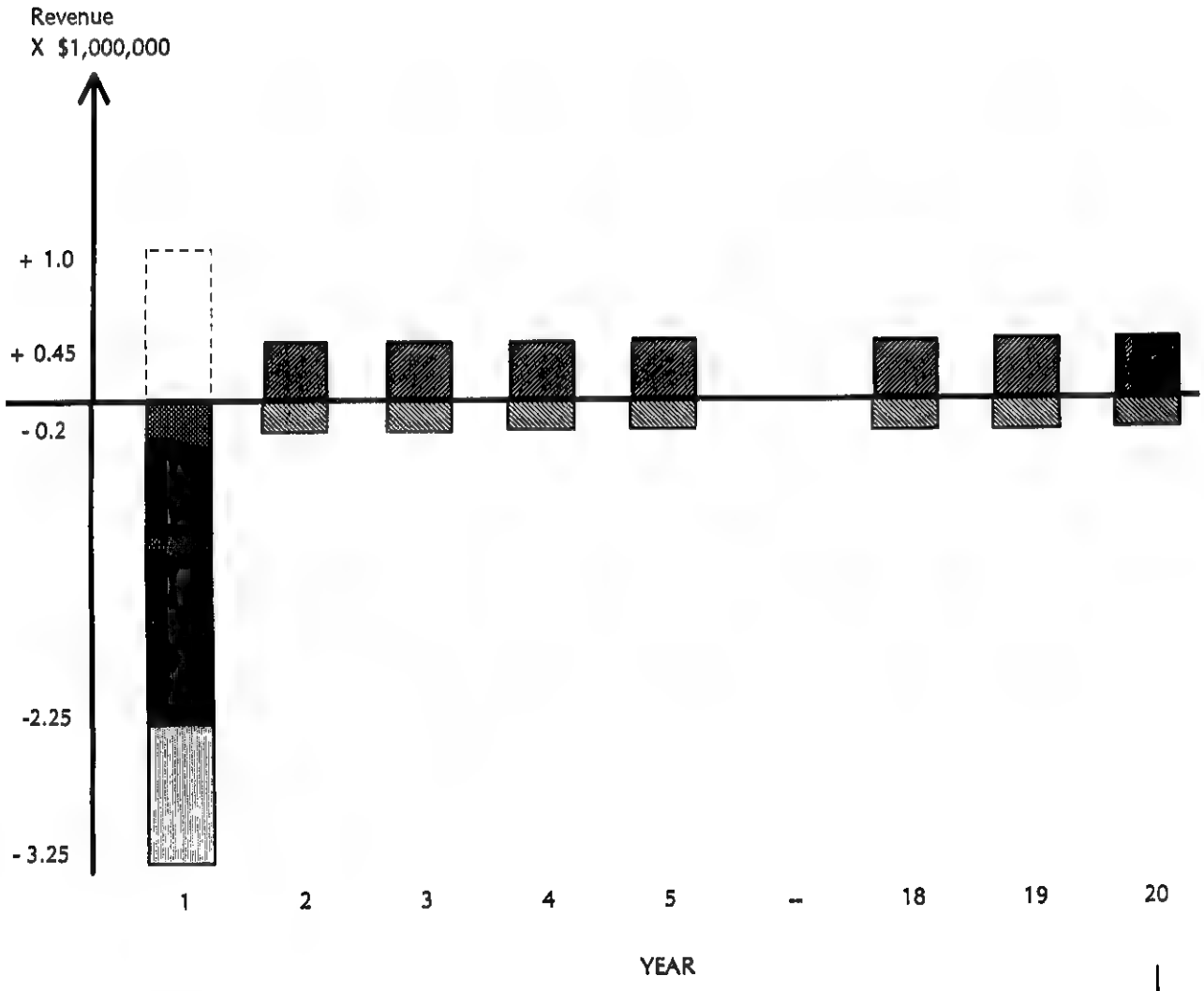


FIGURE 7.1: OVERVIEW OF CASH FLOWS

Of course, if the government borrows the $2.2 mil there are cash flow implications as both principal and interest must be repaid. Repayments will exceed revenues in the early periods of the loan.

As a general indicator, if it is desired to obviate and further negative cash flows the initial grant must be increased to $1.15 mil ($250,000 p.a. services a $2.05 mil 20 year loan @ 10.5% p.a. nominal).

Detailed cash flow analyses are appropriate at the concept development stage.

It is widely held these days that projects such as this should be run in a commercial basis. This suggests that it should be operated by a corporate body operating along private sector lines. Such a body may be set up under the auspice of the Department of Tourism, Metro and the City of Hobart.

The body would be provided with an initial grant of $2.0 mil and required to borrow $1.2 mil on the commercial market. It would be required to pay dividends to its benefactors.

Potentially, the initial grant could be in part made up of in-kind contributions such as a long-term lease of a workshop building at a nominal rent. Federal monies should also be available.

The question now becomes one of whether the benefits of the project are worth $2.0 mil.

On this question it is useful to discuss the government's investment criteria. On the one hand there are some who would argue that projects of this nature should provide a commercial return. However, an alternative view is that the government's very function is to provide those goods that the community needs that markets do not provide. Hence the government provides roads, open space, cultural facilities, etc.

People pay taxes and rates for the express purpose of achieving these things.

Equally, tourism operators pay substantial taxes and they have a legitimate expectation that the government will apply these in part to providing tourism infrastructure. Of course the available resources must be applied to the most worthwhile and cost-effective projects.

Because there will be clearly identifiable beneficiaries of the project in the landowners whose values will rise thre is a storng case for a separate rate or change which would defray costs considerably.

8. ECONOMIC BENEFITS

8.1 NON-FINANCIAL COSTS

The non-financial costs associated with the project are largely confined to streetscape and traffic issues. Both of these factors are amenable to mitigation by design and management solutions, and are arguably marginal in their impact.

8.2 ECONOMIC BENEFITS

The direct economic benefits of such a project are:

- construction employment;
- operational employment;
- increased tourism; and
- multiplier effects associated with the above; and
- enhanced taxation base.

Quantification of these benefits is beyond the scope of this study but some general indicators are:

- 42 person years of employment resulting from construction @14 / $1.0 mil (Source: National Council for Urban Economic Development US Vol 17, N0 3, p 13);

- 4 equivalent full-time jobs ongoing operation;

- $1.25 m additional tourist spending (50,000 patrons - assume 25% stay an extra day and spend $100 [Table 5.4] - equates to 15 tourism jobs);

- conceivably, with multiplier effects and an enhanced taxation (and rate base) the public income sector will drive income which when added to dividends payable by the corporation running the facility will exceed the initial capital investment in value.

In addition to these benefits are a range of benefits which , whilst even more difficult to define, are no less real.

These benefits include:

- mobilisation of latent resources such as the transport museum and the *tram/vintage transport enthusiast* sector;
- catalyst for complementary initiatives such as a vintage bus to the transport museum, a steam ferry on the river and a restaurant tramcar;
- possible extension of the concept to the rail network;
- possible trigger for rail based transit in the future;
- cultural and educational benefits particularly for the young and the cultural heritage orientated tourist.

FIGURE 8.1: VINTAGE US CONNECTION

9. CONCLUSION

The preferred form of the tramway within the terms of the study brief is to run from North Hobart to Salamanca Place via a one-way couplet around the Mall. The system, should be based on the historic narrow gauge running a single double-decker tramcar sourced from Hong Kong and fitted out locally in an arts/crafts theme.

The system should be tourist orientated and implemented by a corporatised body under the auspice of the relevant public agencies. The initial cost of $3.2 will require in the order of $2.0 mil to be in the form of grants or contributions in-kind. The corporate body can service a loan of $1.2 mil and will potentially pay a dividend. There is a potential for the operation to be sold when established and hence to recoup a large part of the $2.0 million initial funding.

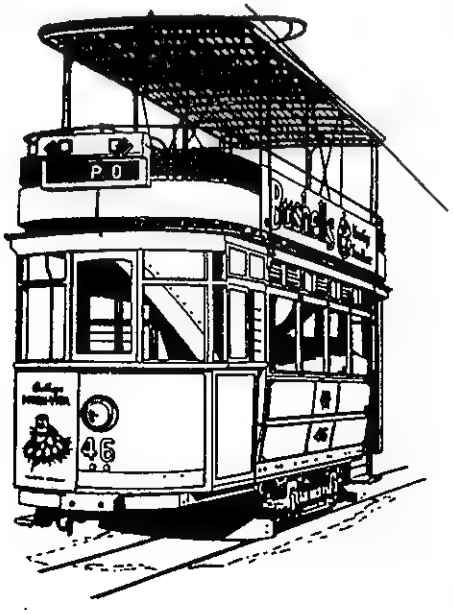
Cost saving initiatives which should be investigated include provision of a depot/workshop - perhaps in a small portion of a wharf shed. Upon establishment, complementary facilities and activities should be vigorously pursued.

Successful implementation within budget relies on substantial goodwill within relevant agencies and a willingness to ensure programs are aligned with the project (eg. streetscape, roadworks and services).

The project is certain to create major benefits including employment creation and the mobilisation of latent resources at a relatively low cost and with little inherent risk. The tourism tramway is a proven concept in other cities and the recommended technology is robust and proven in use elsewhere. Although a detailed analysis has not been carried out, the benefits of the project are conservatively estimated to exceed the costs.

The project should not be expected to meet commercial investment criteria, but rather it should be viewed as a worthwhile and cost-effective element of Hobart's tourism infrastructure for which the tourism sector has paid taxes in various ways to all three levels of government.

Further investigation is required into funding sources. Nevertheless, it is concluded that the project is an important initiative which should be persuade and it can be initiated with quite a modest up-front commitment from the State Government.



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mti

Melbourne Transport International P/L

Transit System Engineers and Consultants

ACN 056421419

APPENDIX A

TECHNICAL ASPECTS AND COSTINGS BY MELBOURNE TRANSPORT INTERNATIONAL PTY LTD

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1. TRAM AVAILABILITY

The sourcing of attractive, reliable, historic and cost effective trams is probably the most important single item effecting the viability of this historic tram proposal. The vehicle concept must excite the government, the tourist operators and the financial backers of this project. MTI have conducted research through their international contacts with the objective of locating a vehicle which satisfies these criteria at a price which would fit within the project budgetary constraints.

1.2 TOURIST APPEAL/HISTORICAL SIGNIFICANCE

The primary focus for the investigation of possible trams was on vehicles which would have tourist appeal and would also have some historical significance given the long history of trams in Hobart.

1.1.1 History of Hobart Tram Types

The original trams used at the start up of the Hobart system in 1893 were of double-deck design with an open top deck covered only by a roof supported on side supports. The lower tram deck was enclosed and access to the upper deck was via spiral staircases at the front and rear of the trams. The trams operated on two axle trucks and these vehicles appear to have been constructed by Lancaster Railway Carriage and Wagon Company Limited in the UK. The trams were powered by two Siemens 12.5 horsepower motors. The so called "standard" Hobart double-deck tram evolved from these early Hobart Electric Tramway (HET) vehicles and later trams featured enclosed driver's positions but still used the open upper deck. The Hobart cars progressed to single deck bogie cars of various configurations.

1.1.2 Tourist Appeal

From the perspective of tourist appeal there is indeed no doubt in our opinion that a double-deck tram would have far greater appeal to tourists than the later single-deck bogie trams. This is due to a number of factors.

- The double-deck vehicle has a much greater connection with the original tram history in Hobart.
- The upper deck of the vehicle would provide excellent views compared to a single-deck tram.
- The unusual appearance of a double-deck tram would excite interest from tourists compared to the more conventional single-deck trams.

1.1.3 Double-deck versus Single-deck Operations and Engineering Issues

The double-deck trams riding on two axle trucks certainly provide an inferior ride compared to later bogie vehicles. The single truck vehicles have a limited top speed of approximately 40-50 kilometres/hour, the top speed is determined by the construction of the tram and the construction and subsequent maintenance of the trackwork. Speed restrictions apply for curves which reduce the overall service speed. At these speeds a historic double deck tram could not be considered a commuter type tram in Australian service conditions. The double-deck tram

trucks are a very simple piece of equipment and could easily be maintained by electrical trades persons after some training. The single-deck bogie cars by comparison have a superior ride and the maximum operating speed would depend on the type of electrical equipment installed in the vehicles. Again the electrical systems on these vehicles are relatively simple and maintenance could be performed by electrical trades persons with some training.

1.2 POSSIBLE SOURCES OF TRAMS.

MTI identified the main potential sources of vehicles within the Asia/Pacific region as follows:

- Melbourne
- Hong Kong
- Historic Tram Groups Australia

Initial discussions were held with both the Melbourne and Hong Kong tramway operators together with two of the historic tram groups in Melbourne and in Sydney. The sourcing of one or two trams from Melbourne or Hong Kong appears to be a possibility but the sourcing of historic trams from the Historic Tram Societies appears extremely unlikely due to the small number of restored vehicles that these societies have in their possession. There are a number of very important factors to be considered when selecting a tram for a historic route such as Hobart and these are discussed in the following sections.

1.2.1 Maintenance Backup

Apart from the selection of a tram with the most appropriate appeal for a historic tram route the most important factor in the selection of a particular source of tram is the maintenance backup that is available to support the selected vehicle. Matters such as spare parts, training and ongoing technical advice will inevitably make the difference between a successful operation and one that struggles to provide vehicles in accordance with advertised schedules.

1.2.2 Spare Parts

An ongoing source of spare parts must be available for the selected vehicle. These spare parts must be new condition spare parts rather than used spare parts salvaged from disused vehicles which would be of questionable condition. This criteria inevitably leads to the fact that the tram selected must still be operating elsewhere in the world, preferably in revenue service and the spare parts would then be obtained from the operator of those vehicles in the origin country.

1.2.3 Maintenance Training

The selected tram must be electrically simple and fortunately with most historic trams, this is the case. Again, if the tram is sourced from a system which is operating outside Hobart the selected staff can be either sent to the tram system for training or alternatively staff from the authority could be seconded to Hobart to perform the training on site.

1.2.4 Technical Advice

Another very important factor associated with ongoing maintenance backup is the availability of future technical advice from an organisation which has both operations and engineering staff

working on the type of vehicle selected. As with spare parts and training, this expert technical advice is obviously far more effective when the origin is an organisation currently using the same vehicle type.

1.2.5 Safety

The selected vehicle should be safe to operate and of a condition which could be considered roadworthy for revenue service.

1.3 COSTING OF TRAMS

The order of costs for the purchase of a new tram ranges from A$3 million to A$3.5 million for one of the latest low-floor European design vehicles to some A$25,000 to A$50,000 for a Melbourne W Class Tram in fairly dilapidated condition. The previous sections lead to the conclusion that the desired vehicle for a tourist tram route is a vehicle with historical significance which is currently being operated elsewhere in the world providing a ready source of maintenance support. For this reason we have not included costings on new vehicles but A$3 million to A$3.5 million can be taken as a very good guide of the current cost of these vehicles. The two systems focused upon as a source of a vehicle with historical significance were Hong Kong and Melbourne. The Historic Tram Societies were not considered seriously as they do not wish to sell their few historic trams and these trams have little, if any, maintenance and spare parts support and would be difficult to operate in regular revenue service.

Contact was made with the Hong Kong Tramways as we were aware through past associations with the tramway that Hong Kong Tramways had provided two historic trams to Blackpool in UK for its historic tram operation. We have obtained Hong Kong Tramway's approval, in principal, for the supply of vehicles to Hobart. This is a particularly attractive proposition as Hong Kong Tramways operate double-deck cars of virtually the same standard as the original Hobart trams. These double-deck cars operate on a two axle truck and also operate on tracks of 3 feet 6 inches, the same as Hobart's original tram system.

Hong Kong Tramways have the facilities for the construction of new tram bodies and new trucks for these trams in their workshops in Hong Kong. The particular configuration of the selected vehicle would be open to discussion, but MTI would recommend Hong Kong Tramway's own tourist tram configuration which is a double-deck design with a half open and half enclosed upper deck. This configuration has proved extremely popular with tourists visiting Hong Kong who wish to use the tram system to provide a unique view of Hong Kong Island. The cars have a seating capacity of 20 people in the lower deck and 15 in the upper deck - total 35. As a budgetary estimate for a new tram to be provided from Hong Kong Tramways a figure of A$300,000 to A$350,000 should be used.

Attached as drawing MT-9011003 is the Hong Kong Tramways double-deck tourist car and the Hong Kong Tramways double deck standard car. The Hong Kong Tramways double-deck tourist car has an open balcony on the top deck at one end of the vehicle however a variation on this has an open balcony at each end of the tram on the top deck.

We have also held discussions with the Public Transport Corporation in Melbourne regarding the possible purchase of one of their W Class trams by Hobart. There is currently an export ban on these vehicles to other countries but this does not appear to apply to the use of these vehicles by other states of Australia. Compared to the Hong Kong alternative the Melbourne

trams provide a somewhat more limited selection of vehicles of historic significance. Melbourne is currently operating only the later styles of W Class trams and the few vehicles in Melbourne's historic tramway fleet are not available for sale to other bodies. A drawing of the Melbourne W Class tram is attached as Melbourne and Metropolitan Tramways Board drawing R10-424. The price of one of these trams restored to reasonably new condition would be A$150,000 to A$200,000. It should be noted however that these restored Melbourne trams do not include new traction motors or new wiring on the vehicle and hence the anticipated reliability and operational life would not be as high as the alternative of a new vehicle from Hong Kong.

Spare Parts

Hong Kong Tramways provides a ready source of new manufactured parts for their vehicles. The sources of these parts have been arranged by Hong Kong Tramways for many years from sources within Hong Kong and China.

With Melbourne's diminishing tram fleet, Melbourne has arranged sources of some items of equipment as new spare parts for W Class trams but also has tended to rely on second-hand spare parts from the W Class trams that have been taken out of commission. Hong Kong therefore has a superior supply of new spare parts for their vehicles.

Training

Both Hong Kong Tramways and Melbourne could provide training either at their workshop or at Hobart site. Melbourne has the restriction of operating within Public Service guidelines on external operations such as the Hobart system whereas Hong Kong Tramways is a commercial operation and does not have these restrictions.

Technical Advice

Again, technical advice is available on an ongoing basis from Melbourne and Hong Kong. Since double-deck trams are the only operational fleet in Hong Kong and W Class trams constitute a small proportion of the Melbourne fleet we believe that there is a greater opportunity for this technical advice from Hong Kong Tramways. It should also be noted that Melbourne has just announced its intention to reduce its fleet of W Class trams to a total number of 51 and this should improve the opportunity for cities such as Hobart to obtain trams from Melbourne for historic tramway operation.

1.4 FUTURE FLEET EXPANSION

Should Hobart commence operation with one or two vehicles in service and tourist passenger demand indicates the requirement for a greater number of vehicles, another factor to be considered is the availability in the future of similar trams. Both Hong Kong and Melbourne tram systems appear to have a certain future for the next 10 to 20 years and this would provide a ready source of vehicles from either of these operators. The same would not apply to vehicles obtained from historic tramways or non-operational sources.

1.5 SINGLE PERSON OPERATION

Another factor which should not be overlooked in selecting a vehicle type is the applicability of the vehicle to single person operation. The tourist operator may wish to operate the vehicle with one person to minimise staffing costs. Again, examining the two selected alternatives of Hong Kong and Melbourne, the Hong Kong tram is currently operating as a one person vehicle. The passengers load at the rear of the vehicle through a one way turnstile and disembark from the front of the vehicle again through a one way turnstile next to the driver. The trams have a fare box next to the driver and the passengers insert the exact amount or greater into the fare box prior to disembarking through the turnstile from the vehicle. This system could be readily adapted to a tourist operation with a one person crew.

As can be seen from the drawing of the Melbourne W Class tram the driver's compartment is isolated from the passenger section of the tram. The Melbourne W Class trams still operate with a conductor and to operate them with one person would require the collection of fares from passengers, probably at one location being the terminus, prior to the driver proceeding to the driver's cab for the particular trip. This system would not be suitable for the boarding and alighting of passengers at intermediate stops as the time required for the driver to perform these activities would introduce unacceptable delays to motor vehicles and would unnecessarily extend the total trip time.

2. STANDARD VERSUS NARROW GAUGE

The selection of the gauge to be used for the system given the difficulty of obtaining a suitable tram will be largely determined by the type of tram selected.

2.1 TRAM AVAILABILITY

From all the factors in the previous section on tram availability we would recommend the use of the Hong Kong vehicle and this would result in a 3 feet 6 inch track gauge. As stated previously this 3 feet 6 inch gauge is the same gauge that was used with Hobart's original tram system.

2.2 USE OF RAILWAY TRACK WORK

The Tasmanian rail track work is also narrow gauge at 3 feet 6 inches and if the use of this track work is contemplated by the tourist operator then clearly this would lead to the use of narrow gauge track for the tourist tram system. If a connection between the tramway and railway systems is contemplated, the type of rail head selected for the historic tram track work would have to be compatible to the rail head used on the rail track work. This may present some difficulties given the wheel tyre size used on the Hong Kong Tramways vehicles and the standard tread profile with its associated tread braking system. This is a subject which would require more detailed investigation when the project proceeds to the next phase.

2.3 ROAD WIDTH USAGE

In considering the overview of routes detailed in section 1 of this report it appears as though double trackwork will be the selected track construction for the Elizabeth Street route option and one way trackwork for the Murray/Argyle route option.

2.3.1 Road Width - Elizabeth St. Option

The total road width used by the dual track system is obviously an important factor. The total clearance distance required for a dual track operation of a Hong Kong tram is 5.5 metres and the equivalent distance for the standard gauge (4 foot 8.5 inches) Melbourne trams is 6.22 metres. The Hong Kong tram therefore occupies less total road width than the Melbourne alternative. Drawings MT-9011004 and MT-9011006 show Hong Kong trams on a street section with a road width of 12.5 metres, with this road width there is sufficient space for a parking/loading zone however the car and tram lane is shared. Drawings MT-90011005 and MT-9011007 show Hong Kong trams on a street section with a road width of 17.5 metres, which provides sufficient space for a parking/loading zone, a separate car lane in each direction and dedicated (or shared) tram lane.

2.3.2 Road Width - Murray/Argyle Option

This option has a one way single track route which has less impact on existing road traffic than the double track construction. The total clearance distance required for single track operation of a Hong Kong tram is 3.0 metres and the equivalent distance for the standard gauge (4 foot 8.5 inches) Melbourne tram is 3.4 metres. Drawing MT-9011008 shows a Hong Kong tram on a street section with a road width of 12.5 metres, with this road width there is sufficient space for a dedicated tram lane on the lefthand side, a parking/loading zone on the righthand side and a car lane in each direction (or two car lanes in one direction for a one way street).

2.4 HISTORICAL FACTORS

The historical purist would obviously prefer a tram track gauge the same as the original Hobart tram system. This however should be a minor factor in the decision rather than the determining factor.

2.5 VEHICLE RIDE

The standard gauge, 4 feet 8.5 inches track gauge, provides a superior ride to the 3 feet 6 inches narrow gauge used in Hong Kong. Again this is a minor factor and tourists may in fact prefer the somewhat more "interesting" ride of the historic 3 feet 6 inches gauge than the more universal standard gauge system.

3. DEPOT FACILITIES

The provision of depot facilities is always a very difficult issue in small historic tram systems as a depot to provide all maintenance facilities is a very costly part of a tram system and small systems incur a reasonable percentage of these depot costs and this is amortised over very few vehicles. The depot facilities question therefore requires particular attention to ensure that only the absolute minimum facilities are provided so that the viability of the system is not affected by the depot cost. The depot facilities must however provide all the base facilities necessary to maintain the tram in safe, reliable condition or the system will have no long term future.

3.1 DEPOT SIZE

From the patronage estimated in section 5 it has been determined that a fleet size of 1 to 2 trams will be sufficient for the initial service. Given the materials used in the construction of these vehicles, a roofed depot is required to ensure the maximum life is obtained from the vehicle body. The minimum depot is therefore a roofed building (maintenance shed) capable of enclosing a single track of 18 metres in length to accommodate the 2 tram fleet.

The single track through the maintenance shed would be supported on columns over a pit of approximately 1.3 metres depth over the whole length of the depot building. A method of lifting the tram body from the tram truck is essential and this could be provided by an overhead gantry crane or alternatively by using four mobile electric jacks. Both systems provide a functional alternative of lifting the tram body from the trucks but the overhead crane has the advantage that the tram trucks can be loaded onto a tray truck and taken elsewhere for heavy maintenance work. It would be highly desirable to have a second open single track running beside the depot maintenance building to provide a wet area for washing of the vehicles and a mechanism of changing the relative positions of the trams within the depot for operations reasons.

3.2 DEPOT LAYOUT

Drawing MT-901102 shows the cross section for the depot maintenance shed and the depot site layout, however the actual site layout will be determined primarily by the shape of the available site with respect to the tram route. The depot runout track work is also shown on the sketch and provides the minimum arrangement for runout of vehicles in either direction from the depot.

3.3 BASE DEPOT EQUIPMENT

The base level of depot equipment necessary for system operation would be as follows:

- Crane or jacking facilities

  Sufficient to enable lifting of tram body from tram truck.

- Wheel machining facilities

  Machining facilities would be essential to allow the removal of "flats" from tram wheels. Unfortunately this equipment is very expensive and therefore we would recommend the use of a spare truck to enable truck changeover in the case of vehicle wheel "flats". The truck with the flat wheel could then be taken to a railway or heavy workshop where the wheel machining could be performed.

- Roof access platform

  A mobile roof access platform would be necessary to obtain access to the roof to provide maintenance for pantograph carbons or trolley pole carbons.

- Mechanical and electrical hand-tools

The only other items of equipment absolutely necessary would be a wide range of electrical and mechanical hand-tools to facilitate the routine maintenance on the vehicles.

3.4 DEPOT FUNCTIONS

Section 4.3.3 details the typical equipment required for the depot in order to perform the following cleaning and minor works:

- Cleaning of tram interior
- Washing of tram exterior
- Adjustment of brakes, replacement of brake shoes
- Replacement of trolley pole carbon blocks
- Lubrication of mechanical parts
- Filling of sand hoppers
- Replacement of miscellaneous items such as light globes, windscreen wiper blades, trolley ropes etc.
- Minor mechanical and electrical repairs
- Brake air line repairs
- General body repairs and painting

In addition the following major overhaul and repair works may need to be performed in the depot:

- Lifting of tram bodies
- Machining of wheels
- Crash repairs
- Bogie and gearbox overhauls

For a historic tourist tramway it is anticipated that only the cleaning and minor works above would be performed within the depot along with any body lifting required for bogie/wheel repair or maintenance. On a commuter tramway all of the above tasks would be performed with in the depot.

3.5 DEPOT LOCATION ALTERNATIVES

Two sites have been identified as potential sites for the a tram depot. These site are associated with the two route options namely the Elizabeth St. option and the Murray/Argyle option and are as follows:

- Melville Street Car Park - Elizabeth St. option
- Princes Wharf Building - Murray/Argyle option

It is understood that there is some community concern regarding the possible redevelopment of the Melville Street car park area and this concern may prevent the use of part of this site for use as a tram depot.

4. TYPE OF SERVICE

There are three basic types of service that can be provided by a tram system proposed for Hobart, these are:

- Tourist Service
- Tourist Plus Service
- Commuter Service

4.1 TOURIST SERVICE

The tourist service is a service which provides the opportunity for visitors to Hobart to observe the main attractions of the city in a comprehensive, easy to use, organised manner. This service provides the tourist with an interesting experience as well as the opportunity for some excellent views of the city and Sullivans Cove. Tourists are prepared to pay a premium for quality sight seeing. Revenue for this type of service can be generated from tour group bookings, inclusion in packaged holidays, hotel booked tours, pre-booked international tourist, individual off the street tourists and souvenir sales.

4.2 TOURIST PLUS SERVICE

The tourist plus service is a service which provides the same service as the tourist service and also tries to capture a small section of the commuter market within the city central area. For a tourist plus service to be successful the route proposed must pass a commuter catchment area and travel to desired a commuter destination as well as meeting the tourist needs.

The tourist plus service may be possible on the Elizabeth St. option as it provides a commuter route from North Hobart into the city, however this route may not meet the tourist service requirements. One of the difficulties in operating a tourist plus service is the fare structure. The aim of the tourist service is to charge a premium for the tram ride as the service is providing a unique experience. However any local commuters wishing to use this service will not want to pay for the experience as their requirement is for transport between two points.

4.3 COMMUTER SERVICE

The commuter service is a service which provides residents of Hobart with a means of public transport. This service must be cheap, reliable, regular, have a high service frequency and operate at a service speed not dissimilar to alternative bus or car transport, in order to capture and retain passengers. For a commuter service to be viable it requires a sufficiently large passenger catchment area and a route which meets the travel needs of the potential commuters. Typically a tram route needs to be approximately 5 to 8km long in the order to attract sufficient passengers from within a half kilometre of the service to remain viable.

With the route options proposed a commuter service tram system would not be viable due to the small passenger catchment area and the much greater set up costs involved in providing a high reliability, high frequency service.

4.4 TYPE OF SERVICE RECOMMENDATION

It is recommended that the type of service for the proposed Hobart tramway be tourist service, this recommendation is based on the following:

- Insufficient passenger catchment area for the proposed route options to support a viable commuter service;
- Set up costs for a commuter service are much higher than for a tourist service due to the requirement for extra vehicles and larger depot.
- Incompatibility of customer requirements of tourist service and commuter (or tourist plus) service.
- Ability to market the tourist service as a unique experience and enter into packaged tours with tour operators.

5. BASIC TOURIST SERVICE

The requirements for a basic tourist service are obvious. The system should pick up tourists from a popular tourist area and take them either to another popular tourist destination or return them to the same area. It is preferable that the selected route has items of tourist interest along the way or alternatively provides city views along the route. A tourist tram system which provides an uninteresting route and has, as its main attraction, the "fun of the tram ride" obviously has less appeal.

5.1 TICKETING

Whilst the exact form of ticketing and revenue is yet to be finalised, a period ticket having validity for two or three hours would be a preferred alternative as this would allow tourists to leave the vehicle at appropriate points of interest along the route and rejoin the service at a later scheduled time for a return trip to Salamanca Place.

5.2 SERVICE SPEED

The estimated service speed will be between 10 to 15 kilometres per hour. For the initial service one tram will be required for service with an additional tram available on standby in case of breakdowns to meet the estimated patronage. The service could be run without the standby tram provided a spare truck is available in case of major breakdown. The spare truck would be used to replace the faulty truck so that the tram could be put back in service. Without the standby tram the service would be disrupted during the period of time it would take to repair the faulty tram or replace the truck.

5.3 HOURS OF SERVICE

The final hours of service selected for the system will inevitably be a compromise between staff costs and the pattern of system patronage over the day. It is likely that the system would commence mid morning and conclude at approximately early evening. This would allow for the operation of a single staff shift thereby minimising the operating costs. It is expected that the tourist potential outside these hours would be at such a level that the service would not be

justified. The service of course would be available after operating hours for use as a function venue which could be hired out on a time basis. These bookings would be made in advance and would not be a regular scheduled service.

6. POWER SUPPLY NETWORK

Three alternatives have been considered for delivering power to the tram. These are:

- Overhead Supply Network
- Auxiliary diesel generator
- Power supply through rails

There are a number of issues with all three of these power delivery methods as detailed below:

6.1 OVERHEAD SUPPLY NETWORK

For a historic tourist service which consists of one route the tram overhead supply network has minimal visual impact because there are no complicated junctions, multiple span wires, insulated crossings or section insulators. In addition by using modern parafil insulated span ropes, the span wire insulators can be removed. For tracks that run along the side of the road, side poles can be used without the need for supporting span wires. The original Hobart tramway system was a commuter system which required the use of feeder cables to maintain the system voltage, however for a tourist tramway operating a small fleet size feeder cables are not required as the trolley wire is sufficient for the power supply requirements.

Towards the end of the original Hobart Tramways life trolley buses were run on the North Hobart and West Hobart routes. The trolley buses require two overhead wires (+ve and -ve) and curve bar on all corners which makes the overhead network for the trolley buses unsightly. This type of network is not required for a tram system.

The cost of installing an overhead supply network consisting of poles, trolley wire, span wire and fittings is approximately:

- Double Track $150,000 per km
- Single Track $100,000 per km

6.2 AUXILIARY DIESEL GENERATOR

It is possible to provide the power supply requirements for the tram from an auxiliary diesel generator set mounted on a trailer which can be towed behind or pushed in front of the tram. To provide the power requirements of the tram the diesel generator set would need an output of approx 40 Kwatt at 500 volts. The disadvantages with this proposal are the noise created by the diesel generator, the less than desirable view of a trailer being pushed or pulled along by a historic tram and the requirement for a tow hitch and power cable connection to the generator trailer. This method of power has been used by the Hunter Valley historic tramway society, however has been found unsatisfactory as the noise was intrusive and therefore detracts from the serenity of tram transport.

The cost of providing an auxiliary power supply unit for each tram is approximately:

- Auxiliary Power Supply unit $150,000 per tram

6.3 POWER SUPPLY THROUGH RAILS

It is technically feasibly to construct a tramway system where the power supply to the tram is delivered by one rail and returned to the substation by the other rail. This system has not been used in any commuter tramway and has a number of limitations. The voltage level for supply to the tram must be at a level which is safe for human contact ie say 50 volt dc, the amount of current required to be carried by the rails would be at least ten times that for an overhead system, the effects of stray current electrolysis on buried assets (water pipes, gas mains etc) would increase. In order for this system to be viable, major modifications would be required to the tram fleet including insulation of wheels from axles, installing of wheel shunts and inclusion of dc-dc chopper to convert the voltage to a useable level.

The cost of providing power supply through the rails is approximately:

- Additional substation equipment $ 50,000
- Tram borne dc-dc Chopper $ 75,000 per tram
- Insulation of trackwork $100,000 per km

6.4 RECOMMENDED POWER SUPPLY NETWORK

It is recommended that the power supply to the tram should be delivered by an overhead wire system, this recommendation is based on the following reasons:

- The overhead wire system is seen as an integral part of a tram system;
- The impact of the overhead wire system can be reduced by using side of the road running, or by the use of parafil rope for centre of the road spans;
- The streetscape can be enhanced by the use of historic appearance poles that support street lighting as we as the overhead wire;
- Diesel generator auxiliary power units are unsightly and the noise generated could ruin the ambience of the tram ride;
- Power through the rails is unproven in mixed traffic operation (trams and cars) and would require major modifications to the proposed trams to be used.
- For a historic tourist tram service, operating on a 2.5km single track, with two trams (one service /one standby) the cost comparisons are as follows:

Overhead network	$250,000
Auxiliary power unit	$300,000
Power through rails	$450,000

7. COSTINGS

7.1 CAPITAL INFRASTRUCTURE COSTS

The costs associated with the establishment and construction of a tramway system vary according to the original intended purpose of the tramway. The design of the tramway will determine the infrastructure costs. Examples of this are as follows:

7.1.1 Trackwork

Trackwork designed for a historic tourist tramway running a small fleet size, at low operating speeds with extended headways can have a trackwork which is simpler in construction than the trackwork required for a commuter service which is operating at higher speeds with more vehicles and close headways. The track alignment, accuracy of track gauge and elevation and construction of joints help determine the safety, ride quality, operating speed and braking performance of the tramway. Since a commuter service operates at much higher service speeds the trackwork design and construction becomes more important. A tramway that had trackwork initially designed for tourist operation may cope as a tourist plus operation but would most certainly require upgrading for a commuter service. The commuter service trackwork would consist of both rails fixed in mass concrete the full width of the track bed with steel ties between the rails at regular intervals. For a historic tourist service the individual rails could be fixed and supported in concrete, but the track bed between the rails would retain the original road construction. Steel ties between the rails would only be used on curves. We believe this method of construction has been used as part of a tram system in Europe but at the time of writing this report we were unable to obtain further details.

7.1.2 Traction Substation

The low speed, extended headway service of a historic tourist tramway requires a less extensive, low capacity traction power substation system and can allow for some reduction in nominal voltage during normal operation. For a commuter service operating with more vehicles at higher service frequency, greater passenger load and at a higher service speed the traction substation system must maintain supply to the overhead network at the nominal voltage and meet the consumption demands of the entire fleet. A tramway with a traction electrical system initially designed for tourist operation may cope as a tourist plus operation but would require upgrading for a commuter service. A commuter service traction substation would consist of a High Voltage ac incoming feeder, H.V. circuit breaker, transformer, rectifier and dc feeder panel providing dc supply to the overhead network at a nominal 600 Volt dc. For a historic tourist service, the traction substation would consist of a 415V ac incoming feeder, ac fuses, rectifier, and dc feeder panel providing dc supply to the overhead network at approx 500 Volt dc. The dc feeder panel for both proposals would consist of a semi high speed circuit breaker, rate of rise protection relay and line test auto reclose system.

7.1.4 Power Supply Network

As detailed in section 4.6.4 the recommended power supply network is an overhead line system. The system would be basically the same for a historic tourist service or a commuter service. Where the commuter service has a very high frequency and service speed additional feeder cables may be required and these cable could either be installed on the overhead line poles or underground.

7.1.5 Depot

For a historic tourist tramway it is anticipated that only the cleaning, painting, routine maintenance and minor works would be performed within the depot along with any body lifting required for bogie/wheel repair or maintenance. On a commuter tramway all of the maintenance tasks detailed in section 4.3.4 would be performed with in the depot. As a result the commuter depot would need greater facilities than the tourist tramway. Also since more trams would be used in service this would require a larger depot building. Conversion from a historic tourist service tramway to a commuter tramway would require an expansion in the size and scope of the depot.

7.2. TYPICAL INFRASTRUCTURE CAPITAL COSTS

The typical infrastructure capital costs for a historic tourist tramway and a commuter tramway are shown below, these costs are applicable to either the Elizabeth St option or the Murray/Argyle option.

7.2.1 Historic Tourist Tramway Infrastructure Costs

Substation		$ 100,000	ea
Trackwork single track		$ 350,000	/km
Trackwork double track		$ 600,000	/km
Overhead single track		$ 100,000	/km
Overhead double track		$ 150,000	/km
Workshop Building (Incl pits, track)		$ 500,000	
Workshop Equipment		$ 50,000	
Lifting Equipment	(mobile jacks)	$ 80,000	
	(Jib crane)	$ 20,000	
Manual points		$ 10,000	ea

7.2.2 Commuter Tramway Infrastructure Costs

Substation		$ 500,000	ea
Trackwork single track		$ 600,000	/km
Trackwork double track		$1,200,000	/km
Overhead single track		$ 100,000	/km
Overhead double track		$ 150,000	/km
Workshop Building (10 trams)		$1,500,000	
Wheel Profiling Machine		$1,000,000	
Workshop Equipment		$ 100,000	
Lifting Equipment	(mobile jacks)	$ 120,000	
	(Jib crane)	$ 20,000	
Motorised points		$ 50,000	ea

7.3 OPERATING COSTS

The operating costs for either a historic tourist tramway or a commuter tramway are difficult to establish in dollar terms unless the route, times of operation, service frequency and number of vehicle in service are fully established.

7.3.1 Typical Commuter Tramway Operating Costs

For a commuter tramway it is more appropriate to detail the approximate operating costs in terms of cents per kilometre travelled and a the ratio between various cost centres. These costs can then be used to establish more accurately the actual operating cost for a commuter tramway regardless of size.

Based on the annual reports of the Melbourne and Metropolitan Tramways Board from 1971 through to 1982 (after that date the expenses were no longer itemised) an approximation can be made of the cost structure ratio for a commuter tramway. Note these ratios have been adjusted to take into account one man operation.

The cost structure ratio of a commuter tramway will be in the order of:

Traffic Operations (drivers)	44.5%
Maintenance of Track	7.3%
Maintenance of Tram	24.8%
Maintenance of Elec Equipment	5.7%
Maintenance of Buildings	2.4%
Traction Energy	4.9%
General Admin/Stores	10.4%

Typical operating cost on a cents per km basis for Melbourne are approximately:

Total operating cost	$4.64/km
Maintenance of Trams	$1.15/km
Traction Energy	$0.22/km

These figures have been adjusted for inflation and may change slightly as a result of cost of labour, staff rostering practices and cost of electricity in Hobart and also as a result of the level of in-house and contract maintenance, however the above figures and percentage ratios should be suitable for establishing actual anticipated operating costs.

7.3.1 Typical Tourist Tramway Operating Costs

For a tourist tramway it is expected that the cost structure ratio for a commuter tramway would have to be adjusted to take into account the different nature of the two services. The traffic operations percentage, the maintenance of buildings percentage and maintenance of electrical equipment percentage would reduce as a result of the higher proportional costs (and therefore higher percentage) for adminstration. In particular the fixed cost associated with insurance and the publicity costs are expenses that are not significant for a commuter tramway but become significant costs for tourist tramway. Note track maintenance costs are not included in the tourist tramway ratios as the road surface is maintained by the local council.

The maintenance of trams consists of two components, approx 50% for regular maintenance and 50% for heavy overhaul and accident repairs. It is likely that the tram maintenance percentage would reduce as a result of less accident repairs due to a lower speed of operation.

The cents per km costing may not be applicable to a historic tourist tramway because of the low number of kilometres travelled. The estimated operating costs operating costs from this method should be cross checked against the costs of an existing tourist tramway.

An alternative method of estimating the operating costs is to look at the operating costs of a similar tourist tramway such as the Ballarat tramway and adjust these figures to suit the Hobart circumstances.

The following is the annual expenses incurred by the Ballarat Tourist Tramway during the 90/91 financial year. Note that the Ballarat Tramway operated for 176 days during the financial year and that it is predominantly administered and operated by volunteers.

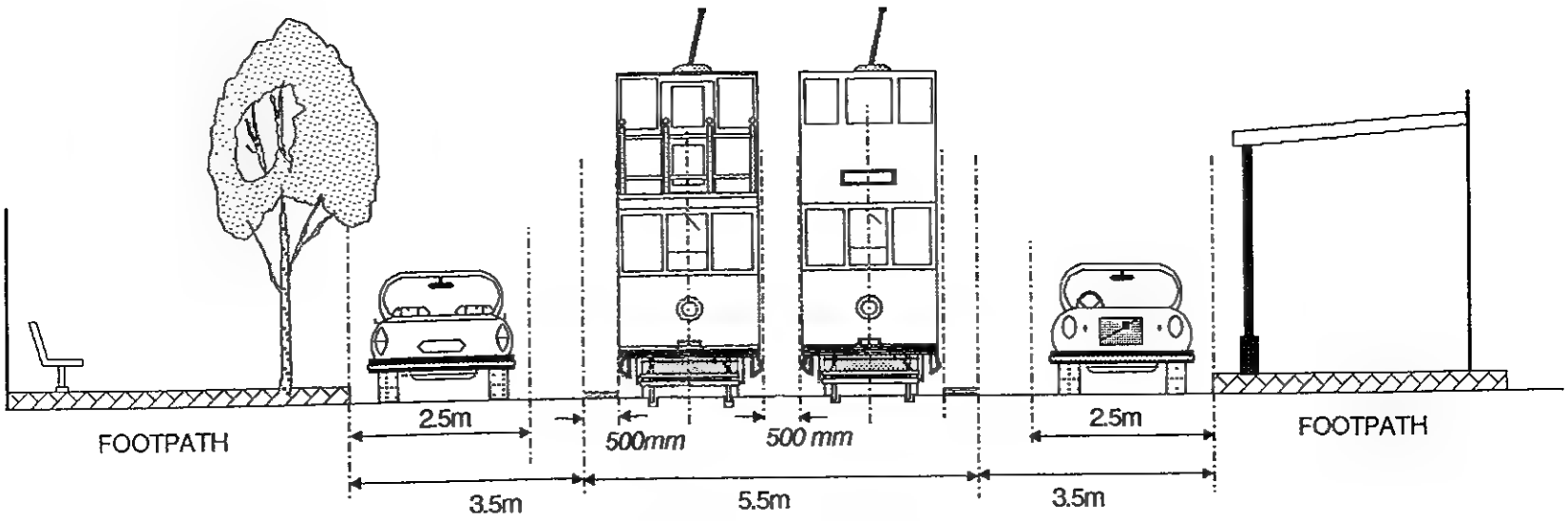
Item	Expenditure
Stationary/Postage etc	$11,000
Insurance	$14,000
Power	$ 8,000
Publicity	$ 3,000
Tram Maintenance	$ 4,500
Overhead/Pole replacement	$ 2,000
Track Maintenance	nil
Depot Maintenance	$ 3,000
Equipment/ Tools	$ 1,500
Wages	$20,000

7.3.2 Hobart Tourist Tramway Operating Costs

For the proposed Hobart tourist tramway it is expected that the Ballarat tramway overhead/pole replacement and equipment/tools expenditure would not apply. However the Ballarat operating expenses need to be factored to take into account 7 days a week operation and wages for two drivers and part time administration must be included. For maximum efficiency the drivers should be multi-skilled and adequately trained to perform the day to day routine maintenance of the trams. In addition qualified driving staff from the Tramway Historical Society should be recruited and trained to provide emergency staff relief in the event of both drivers not being available.

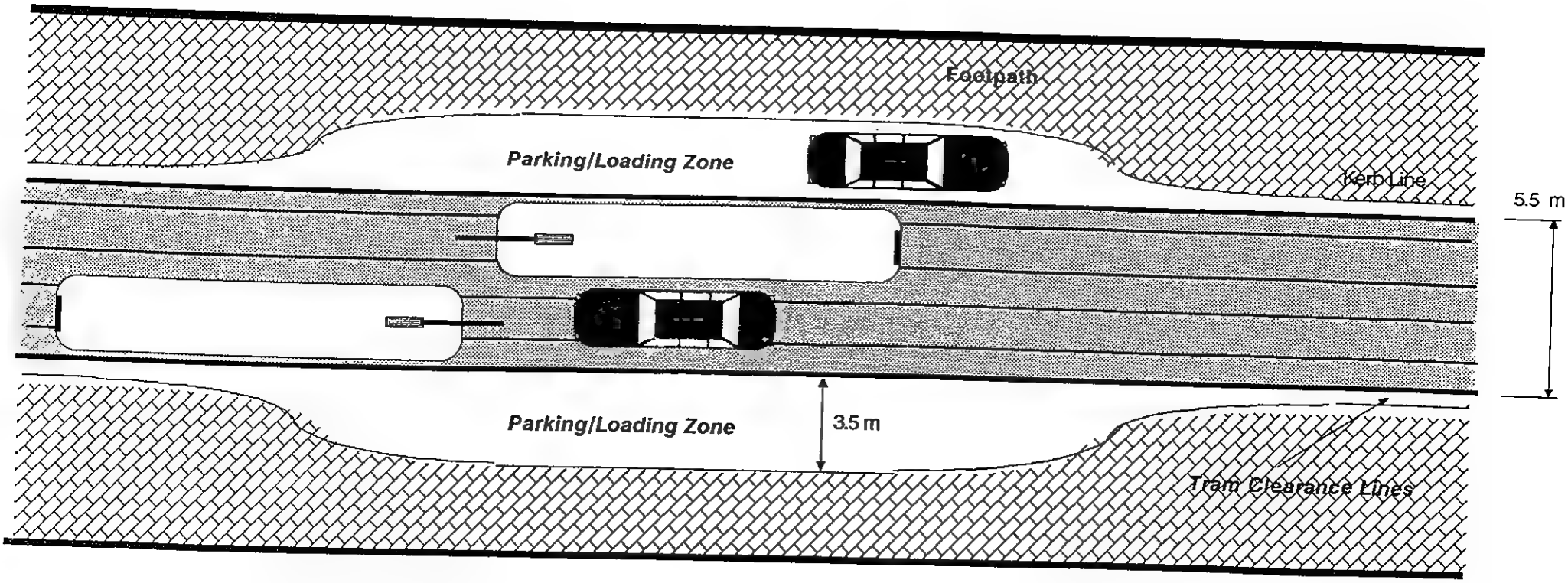
Item	Expenditure
Stationary/Postage etc	$22,000
Insurance	$28,000
Power	$16,000
Publicity	$ 6,000
Tram Maintenance	$ 9,000
Depot Maintenance	$ 6,000
Driver Wages	$60,000
Administration Wages	$10,000
Total	$ 157,000 p.a.

HISTORIC TRAM ROUTE



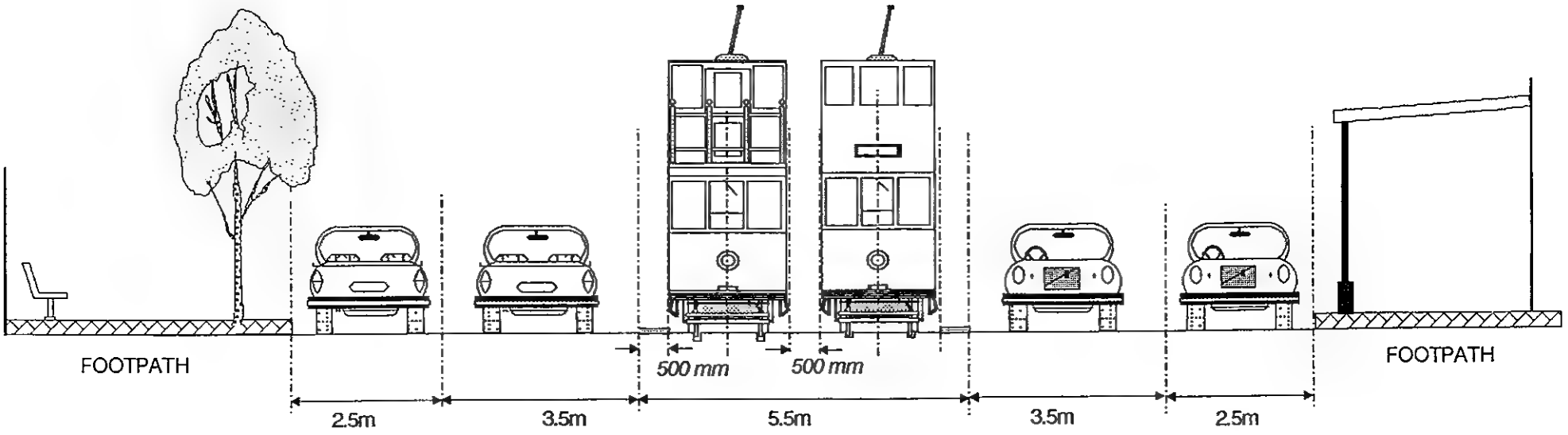
Melbourne Transport International	Drawing No. MT-9011004
STREET SECTION 12.5 m Road Width	

HISTORIC TRAM ROUTE



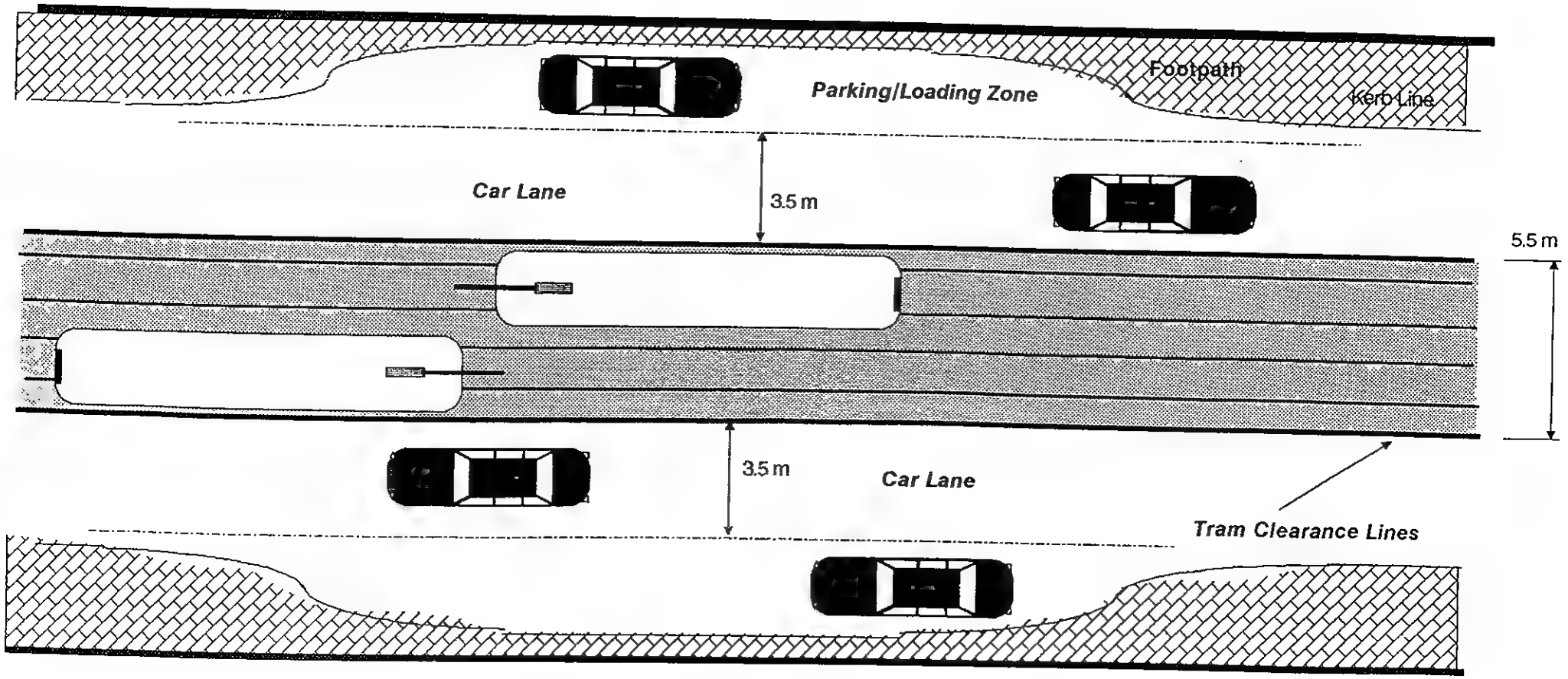
Melbourne Transport International	Drawing No. MT-9011006
STREET PLAN 12.5 m Road Width	

HISTORIC TRAM ROUTE

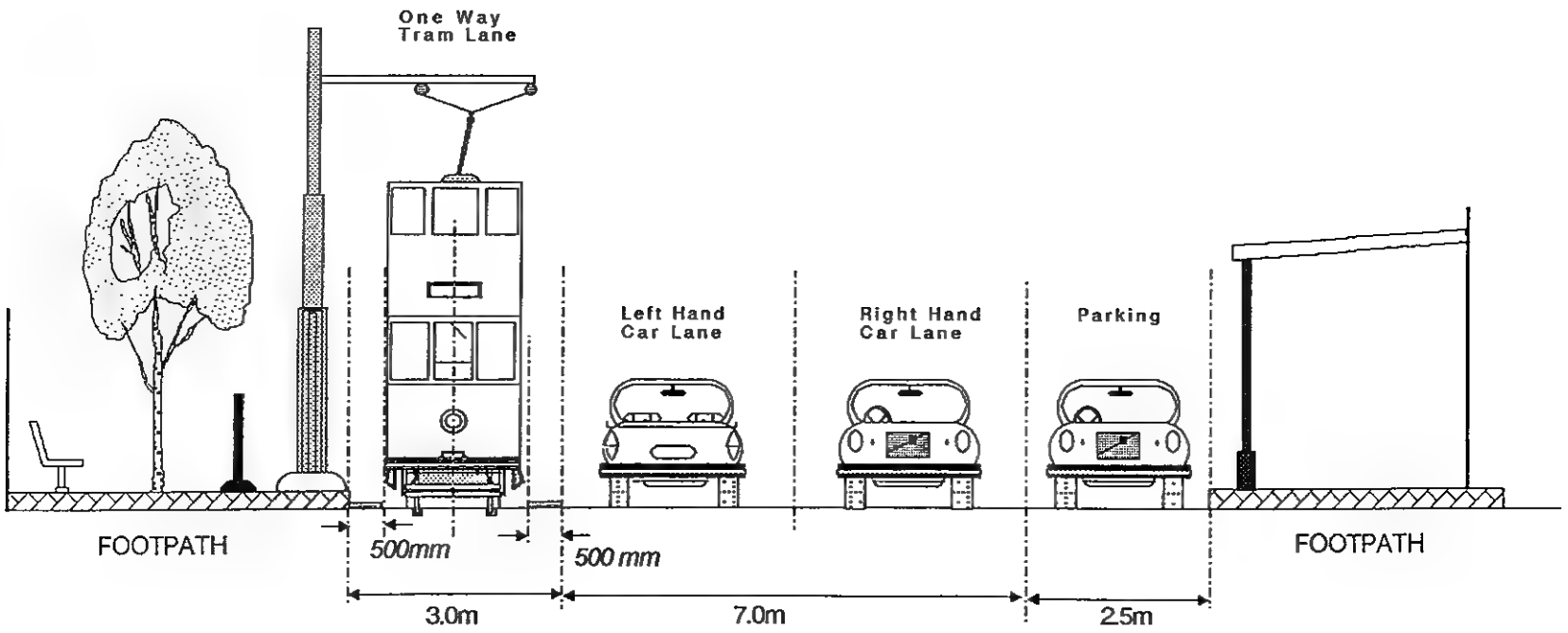


Melbourne Transport International	Drawing No. **MT-9011005**
STREET SECTION 17.5 m Road Width	

HISTORIC TRAM ROUTE

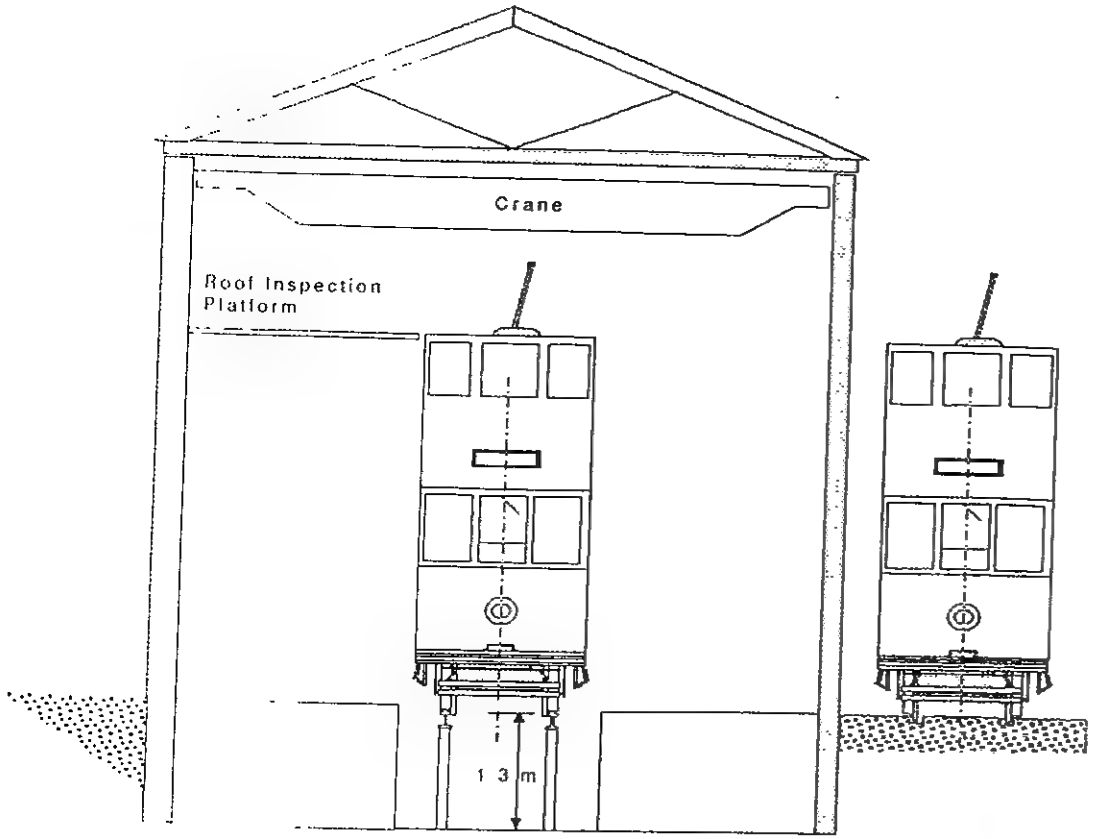


Melbourne Transport International	Drawing No. MT-9011007
STREET PLAN 17.5 m Road Width	



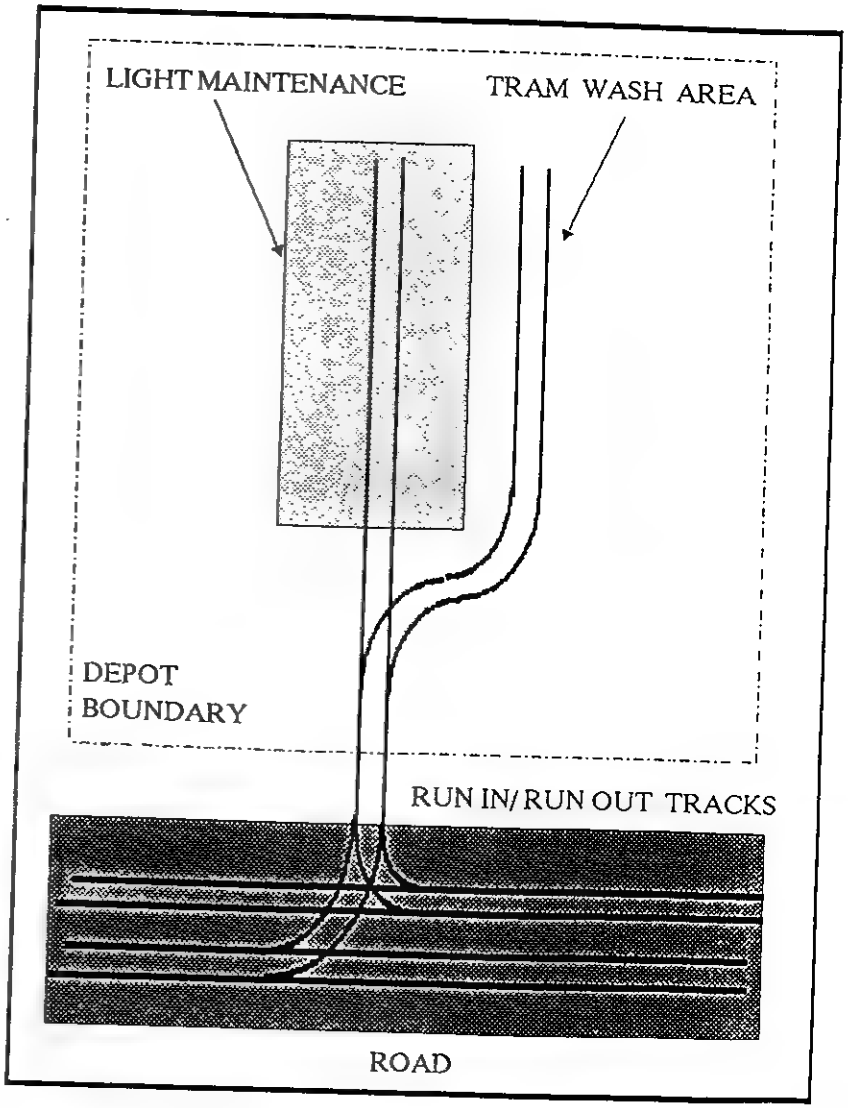
Melbourne Transport International	Drawing No. **MT-9011008**
KERBSIDE TRACK 12.5 m Road Width	

Depot Building



LIGHT MAINTENANCE AREA TRAM WASH AREA

Site Layout

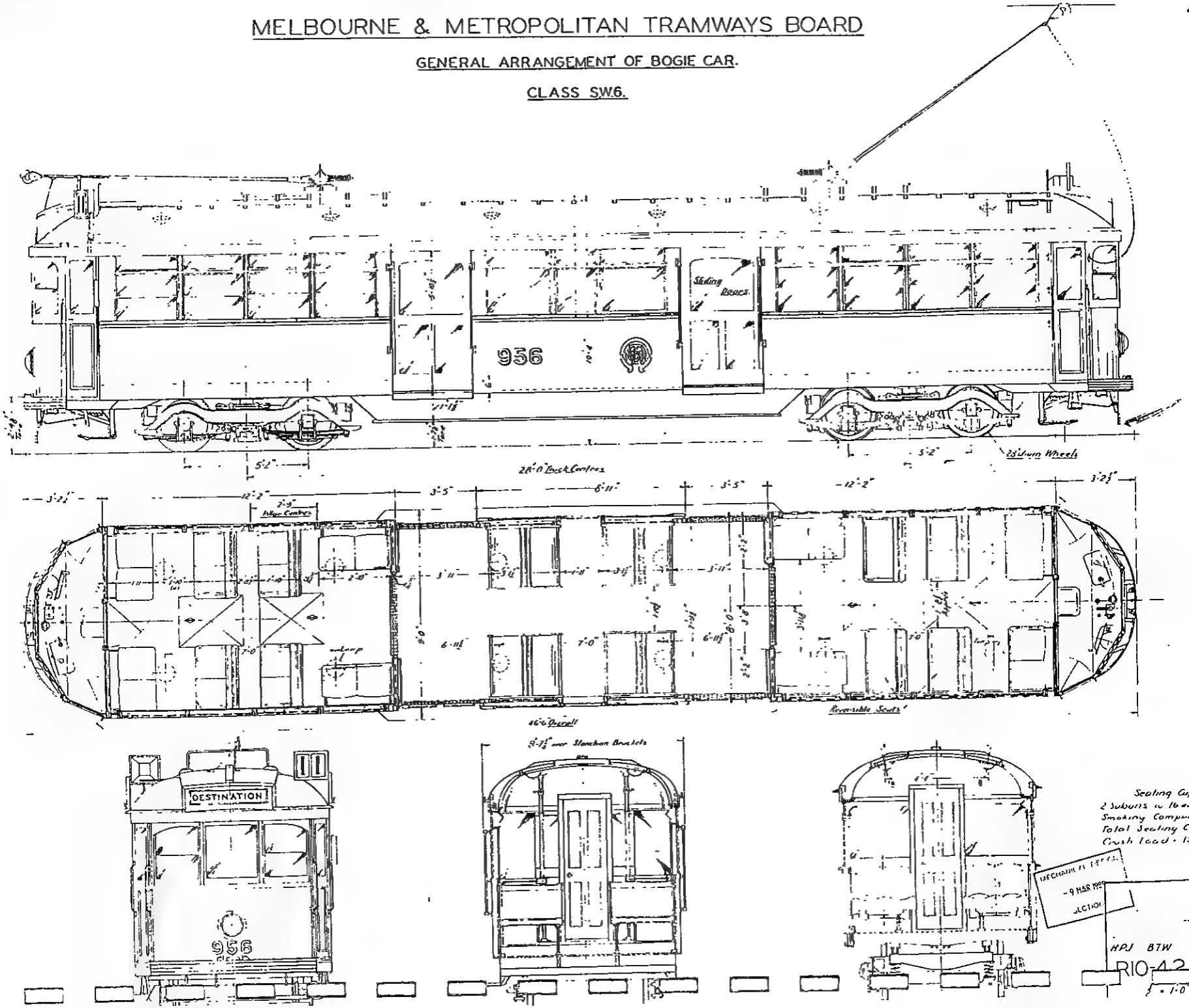


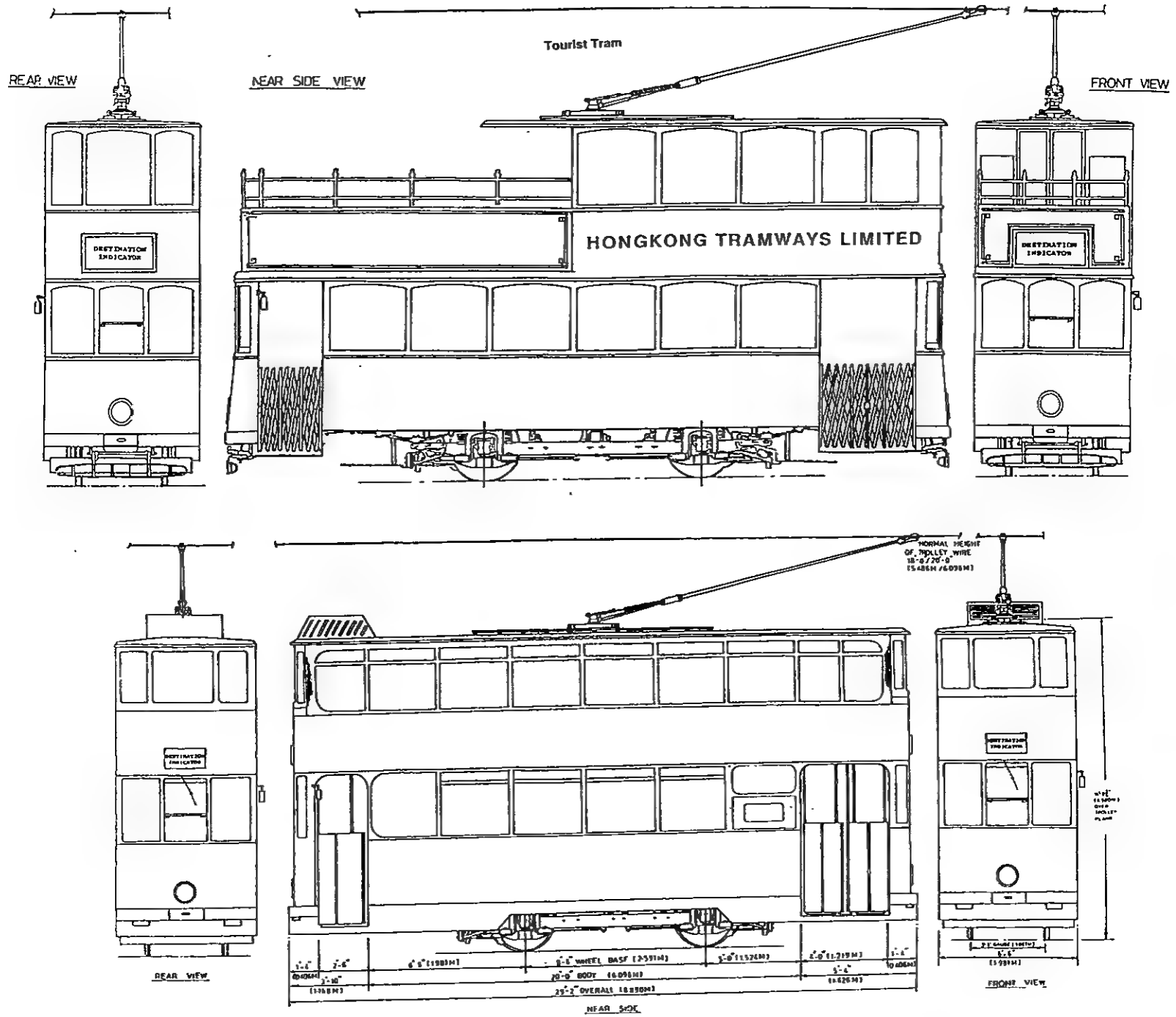
Melbourne Transport International	Drawing No. MT-9011002
Typical Depot Building and Site Layout	

MELBOURNE & METROPOLITAN TRAMWAYS BOARD

GENERAL ARRANGEMENT OF BOGIE CAR.

CLASS SW6.





Standard Tram

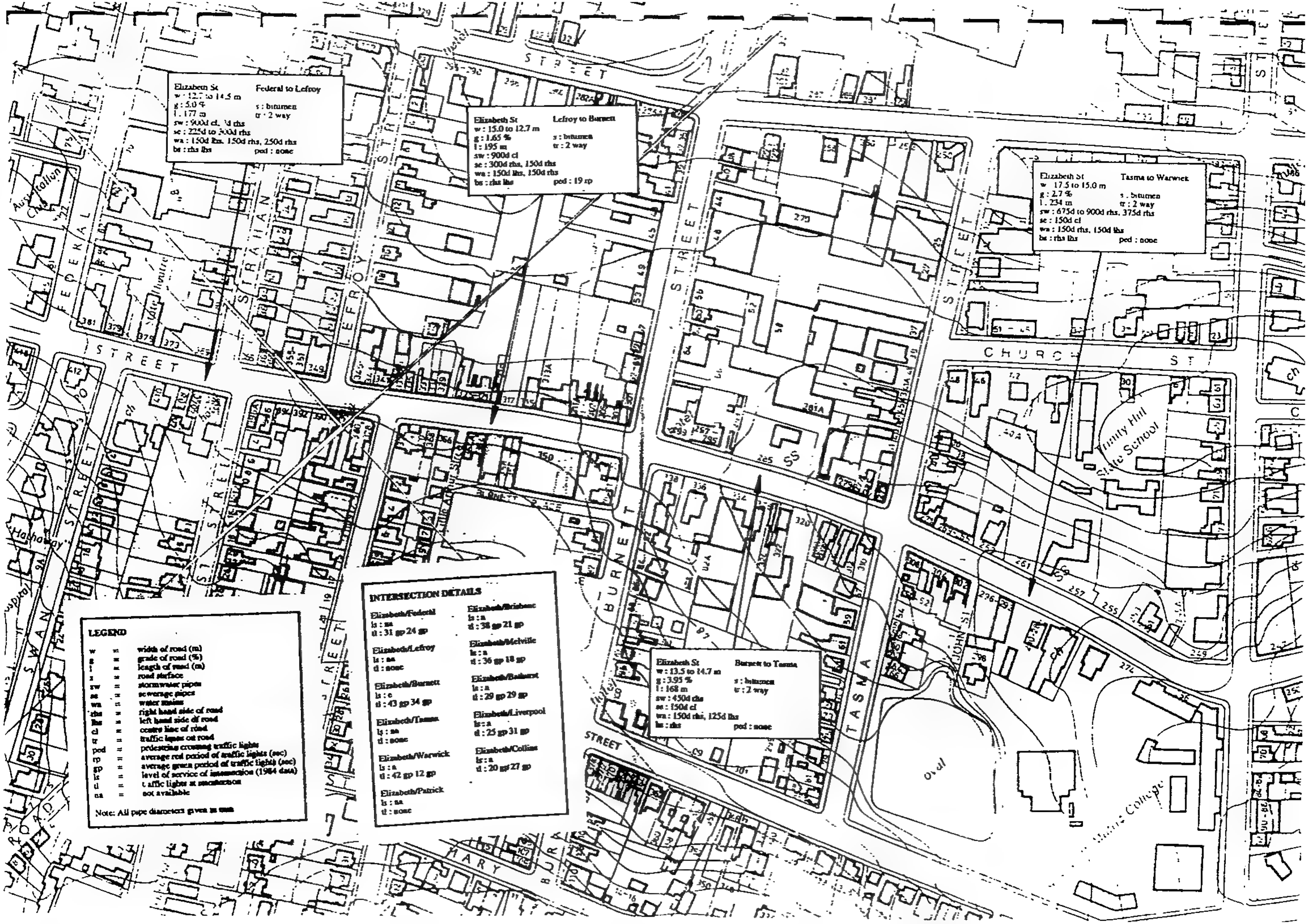
Melbourne Transport International	Drawing No. MT-9011003
Drawings of Hong Kong Trams	

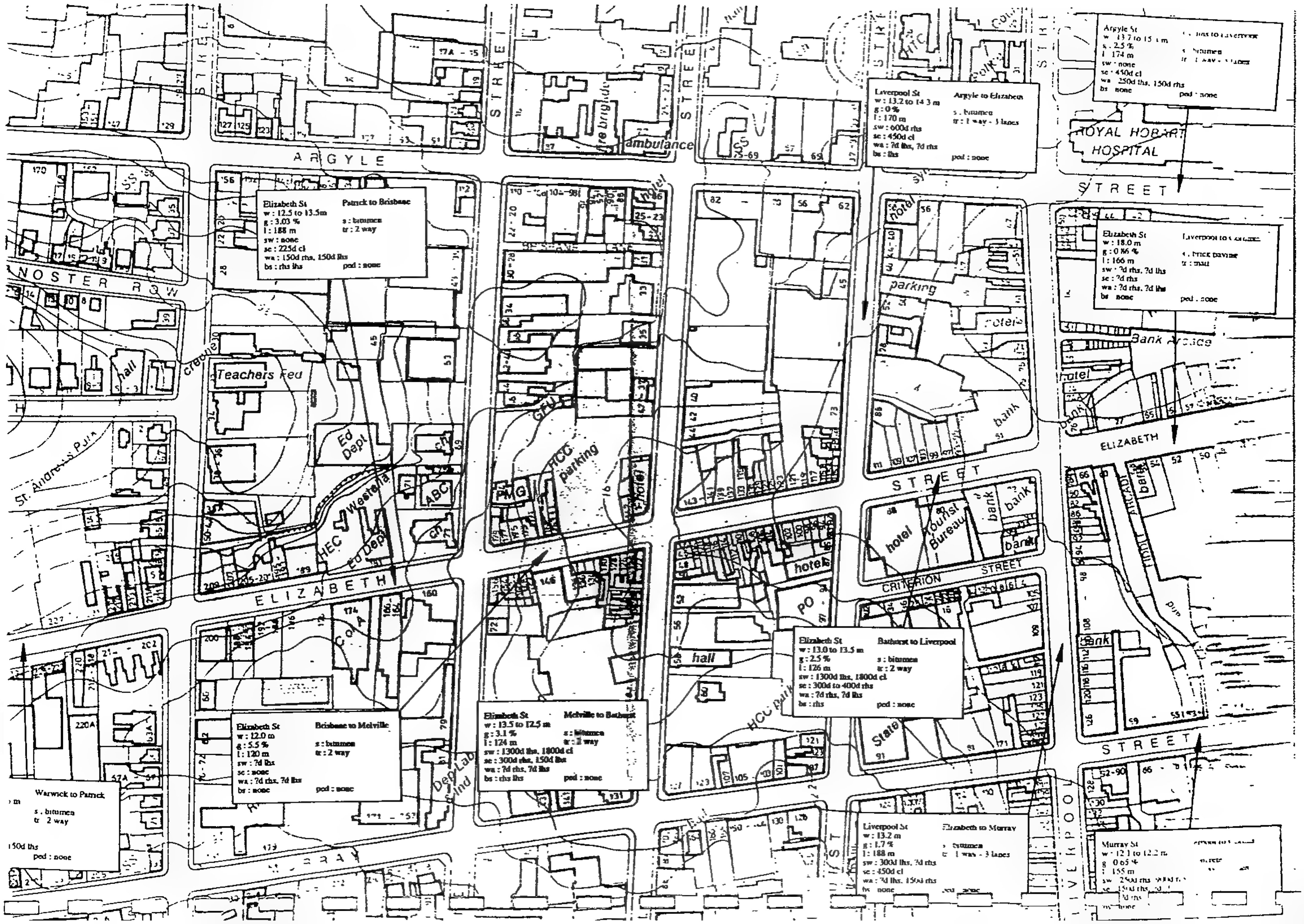
THOMPSON & BRETT PTY LTD
CONSULTING ENGINEERS

7 Bayfield Street Rosny Park 7018
Tel [002] 44 6633 Fax [002] 44 6221

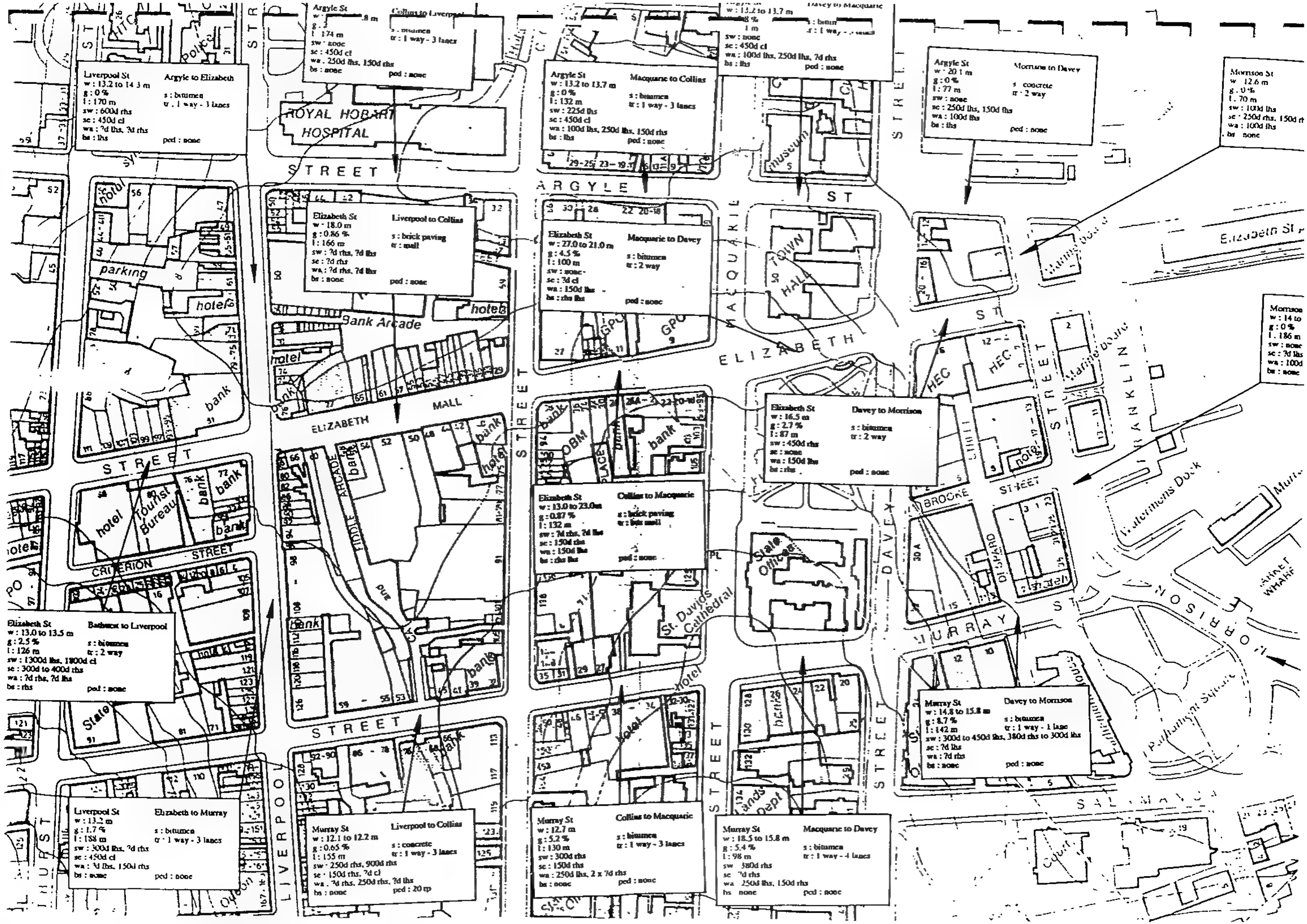
APPENDIX B

ROAD CONDITIONS

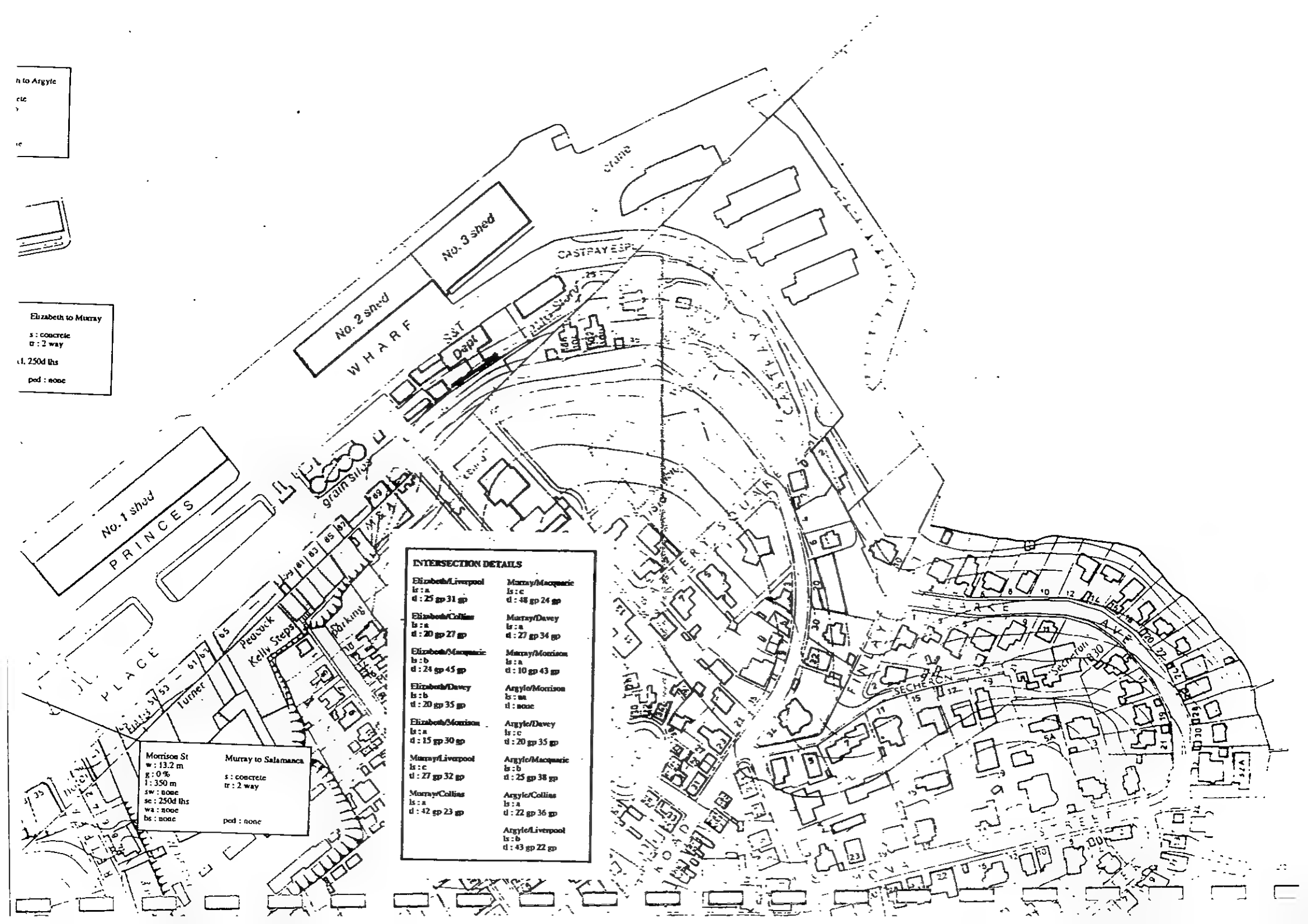

Elizabeth St Federal to Lefroy
w : 12.7 to 14.5 m
g : 5.0 %
l : 177 m
s : bitumen
tr : 2 way
sw : 900d cl, 3d rhs
se : 225d to 300d rhs
wa : 150d lhs, 150d rhs, 250d rhs
bs : rhs lhs
ped : none
Elizabeth St Lefroy to Burnett
w : 15.0 to 12.7 m
g : 1.65 %
l : 195 m
s : bitumen
tr : 2 way
sw : 900d cl
se : 300d rhs, 150d rhs
wa : 150d lhs, 150d rhs
bs : rhs lhs
ped : 19 rp
Elizabeth St Tasma to Warwick
w : 17.5 to 15.0 m
g : 2.7 %
l : 234 m
s : bitumen
tr : 2 way
sw : 675d to 900d rhs, 375d rhs
se : 150d cl
wa : 150d rhs, 150d lhs
bs : rhs lhs
ped : none
Elizabeth St Burnett to Tasma
w : 13.5 to 14.7 m
g : 3.95 %
l : 168 m
s : bitumen
tr : 2 way
sw : 450d rhs
se : 150d cl
wa : 150d rhs, 125d lhs
bs : rhs
ped : none
LEGEND
w = width of road (m)
g = grade of road (%)
l = length of road (m)
s = road surface
sw = stormwater pipes
se = sewerage pipes
wa = water mains
rhs = right hand side of road
lhs = left hand side of road
cl = centre line of road
tr = traffic lanes on road
ped = pedestrian crossing traffic lights
rp = average red period of traffic lights (sec)
gp = average green period of traffic lights (sec)
ls = level of service of intersection (1984 data)
tl = traffic lights at intersection
na = not available
Note: All pipe diameters given in mm
INTERSECTION DETAILS
Elizabeth/Federal
ls : na
tl : 31 gp 24 gp
Elizabeth/Lefroy
ls : na
tl : none
Elizabeth/Burnett
ls : e
tl : 43 gp 34 gp
Elizabeth/Tasma
ls : na
tl : none
Elizabeth/Warwick
ls : a
tl : 42 gp 12 gp
Elizabeth/Patrick
ls : na
tl : none
Elizabeth/Brisbane
ls : a
tl : 38 gp 21 gp
Elizabeth/Melville
ls : a
tl : 36 gp 18 gp
Elizabeth/Bathurst
ls : a
tl : 29 gp 29 gp
Elizabeth/Liverpool
ls : a
tl : 25 gp 31 gp
Elizabeth/Collins
ls : a
tl : 20 gp 27 gp
FEDERAL STREET
LEFROY STREET
STRAHAN STREET
BURNETT STREET
CHURCH ST
TASMA
JOHN ST
MARY
SWAN
STREET
Trinity Hill State School
Oval



ARGYLE
ELIZABETH
STREET
LIVERPOOL
CRITERION STREET
MURRAY
NOSTER ROW
ROYAL HOBART HOSPITAL
fire brigade
ambulance
Teachers Fed
Ed Dept
HEC
HCC parking
hotel
parking
bank
Bank Arcade
Tourist Bureau
PO
hall
State
creche
St. Andrews
ARCADE
Elizabeth St
w : 12.5 to 13.5m
g : 3.03 %
l : 188 m
sw : none
se : 225d cl
wa : 150d rhs, 150d lhs
bs : rhs lhs
Patrick to Brisbane
s : bitumen
tr : 2 way
ped : none
Elizabeth St
w : 12.0 m
g : 5.5 %
l : 120 m
sw : 7d lhs
se : none
wa : 7d rhs, 7d lhs
bs : none
Brisbane to Melville
s : bitumen
tr : 2 way
ped : none
Elizabeth St
w : 13.5 to 12.5 m
g : 3.1 %
l : 124 m
sw : 1300d lhs, 1800d cl
se : 300d rhs, 150d lhs
wa : 7d rhs, 7d lhs
bs : rhs lhs
Melville to Bathurst
s : bitumen
tr : 2 way
ped : none
Elizabeth St
w : 13.0 to 13.5 m
g : 2.5 %
l : 126 m
sw : 1300d lhs, 1800d cl
se : 300d to 400d rhs
wa : 7d rhs, 7d lhs
bs : rhs
Bathurst to Liverpool
s : bitumen
tr : 2 way
ped : none
Liverpool St
w : 13.2 to 14.3 m
g : 0 %
l : 170 m
sw : 600d rhs
se : 450d cl
wa : 7d lhs, 7d rhs
bs : lhs
Argyle to Elizabeth
s : bitumen
tr : 1 way - 3 lanes
ped : none
Argyle St
w : 13.7 to 15.1 m
s : 2.5 %
l : 174 m
sw : none
se : 450d cl
wa : 250d rhs, 150d rhs
bs : none
s : bitumen
ped : none
Elizabeth St
w : 18.0 m
g : 0.86 %
l : 166 m
sw : 7d rhs, 7d lhs
se : 7d rhs
wa : 7d rhs, 7d lhs
bs : none
s : brick paving
tr : mall
ped : none
Liverpool St
w : 13.2 m
g : 1.7 %
l : 188 m
sw : 300d lhs, 7d rhs
se : 450d cl
wa : 7d lhs, 150d rhs
bs : none
Elizabeth to Murray
s : bitumen
tr : 1 way - 3 lanes
ped : none
Murray St
Warwick to Patrick
s : bitumen
tr : 2 way
150d lhs
ped : none



Liverpool St
w : 13.2 to 14.3 m
g : 0 %
l : 170 m
sw : 600d rhs
se : 450d cl
wa : 7d rhs, 7d rhs
bs : lhs
Argyle to Elizabeth
s : bitumen
tr : 1 way - 3 lanes
ped : none
Argyle St
l : 174 m
sw : none
se : 450d cl
wa : 250d lhs, 150d rhs
bs : none
Collins to Liverpool
s : bitumen
tr : 1 way - 3 lanes
ped : none
Argyle St
w : 13.2 to 13.7 m
g : 0 %
l : 132 m
sw : 225d lhs
se : 450d cl
wa : 100d lhs, 250d lhs, 150d rhs
bs : lhs
Macquarie to Collins
s : bitumen
tr : 1 way - 3 lanes
ped : none
Davey to Macquarie
sw : none
se : 450d cl
wa : 100d lhs, 250d lhs, 7d rhs
bs : lhs
ped : none
Argyle St
w : 20.1 m
g : 0 %
l : 77 m
sw : none
se : 250d lhs, 150d rhs
wa : 100d lhs
bs : lhs
Morrison to Davey
s : concrete
tr : 2 way
ped : none
Morrison St
w : 12.6 m
g : 0 %
l : 70 m
sw : 100d lhs
wa : 100d lhs
bs : none
Elizabeth St
w : 18.0 m
g : 0.86 %
l : 166 m
sw : 7d rhs, 7d lhs
se : 7d rhs
wa : 7d rhs, 7d lhs
bs : none
Liverpool to Collins
s : brick paving
tr : mall
ped : none
Elizabeth St
w : 27.0 to 21.0 m
g : 4.5 %
l : 100 m
sw : none
se : 7d cl
wa : 150d lhs
bs : rhs lhs
Macquarie to Davey
s : bitumen
tr : 2 way
ped : none
Morrison
w : 14 to
g : 0 %
l : 186 m
sw : none
bs : none
Elizabeth St
w : 16.5 m
g : 2.7 %
l : 87 m
sw : 450d rhs
se : none
wa : 150d lhs
bs : rhs
Davey to Morrison
s : bitumen
tr : 2 way
ped : none
Elizabeth St
w : 13.0 to 23.0 m
g : 0.87 %
l : 132 m
sw : 7d rhs, 7d lhs
se : 150d rhs
wa : 150d lhs
bs : rhs lhs
Collins to Macquarie
s : brick paving
ped : none
Elizabeth St
w : 13.0 to 13.5 m
g : 2.5 %
l : 126 m
sw : 1300d lhs, 1800d cl
se : 300d to 400d rhs
wa : 7d rhs, 7d lhs
bs : rhs
Bathurst to Liverpool
s : bitumen
tr : 2 way
ped : none
Murray St
w : 14.8 to 15.8 m
g : 8.7 %
l : 142 m
sw : 300d to 450d lhs, 380d rhs to 300d lhs
se : 7d lhs
wa : 7d rhs
bs : none
Davey to Morrison
s : bitumen
tr : 1 way - 1 lane
ped : none
Liverpool St
w : 13.2 m
g : 1.7 %
l : 188 m
sw : 300d lhs, 7d rhs
se : 450d cl
wa : 7d lhs, 150d rhs
bs : none
Elizabeth to Murray
s : bitumen
tr : 1 way - 3 lanes
ped : none
Murray St
w : 12.1 to 12.2 m
g : 0.65 %
l : 155 m
sw : 250d rhs, 900d rhs
se : 150d rhs, 7d cl
wa : 7d rhs, 250d rhs, 7d lhs
bs : none
Liverpool to Collins
s : concrete
tr : 1 way - 3 lanes
ped : 20 rp
Murray St
w : 12.7 m
g : 5.2 %
l : 130 m
sw : 300d rhs
se : 150d rhs
wa : 250d lhs, 2 x 7d rhs
bs : none
Collins to Macquarie
s : bitumen
tr : 1 way - 3 lanes
ped : none
Murray St
w : 18.5 to 15.8 m
g : 5.4 %
l : 98 m
sw : 380d rhs
se : 7d rhs
wa : 250d lhs, 150d rhs
bs : none
Macquarie to Davey
s : bitumen
tr : 1 way - 4 lanes
ped : none
ROYAL HOBART HOSPITAL
ARGYLE STREET
MACQUARIE ST
ELIZABETH STREET
ELIZABETH MALL
Bank Arcade
FIDDLE ARCADE
CRITERION STREET
LIVERPOOL STREET
COLLINS STREET
DAVEY STREET
MURRAY ST
SALAMANCA
MORRISON
FRANKLIN
BROOKE STREET
TOWN HALL
museum
GPO
State Offices
St. Davids Cathedral
Tourist Bureau
Parliament Square
Watermans Dock
Court
parking
hotel
bank
HEC


No. 3 shed
No. 2 shed
WHARF
No. 1 shed
PRINCES
PLACE
grain silos
Peacock
Kelly Steps
Turner
Elizabeth to Murray
s : concrete
tr : 2 way
ped : none
Morrison St
w : 13.2 m
g : 0 %
l : 350 m
sw : none
se : 250d lhs
wa : none
bs : none
Murray to Salamanca
s : concrete
tr : 2 way
ped : none
INTERSECTION DETAILS
Elizabeth/Liverpool
ls : a
d : 25 gp 31 gp
Elizabeth/Collins
ls : a
d : 20 gp 27 gp
Elizabeth/Macquarie
ls : b
d : 24 gp 45 gp
Elizabeth/Davey
ls : b
d : 20 gp 35 gp
Elizabeth/Morrison
ls : a
d : 15 gp 30 gp
Murray/Liverpool
ls : c
d : 27 gp 32 gp
Murray/Collins
ls : a
d : 42 gp 23 gp
Murray/Macquarie
ls : c
d : 48 gp 24 gp
Murray/Davey
ls : a
d : 27 gp 34 gp
Murray/Morrison
ls : a
d : 10 gp 43 gp
Argyle/Morrison
ls : aa
d : none
Argyle/Davey
ls : c
d : 20 gp 35 gp
Argyle/Macquarie
ls : b
d : 25 gp 38 gp
Argyle/Collins
ls : a
d : 22 gp 36 gp
Argyle/Liverpool
ls : b
d : 43 gp 22 gp

APPENDIX C

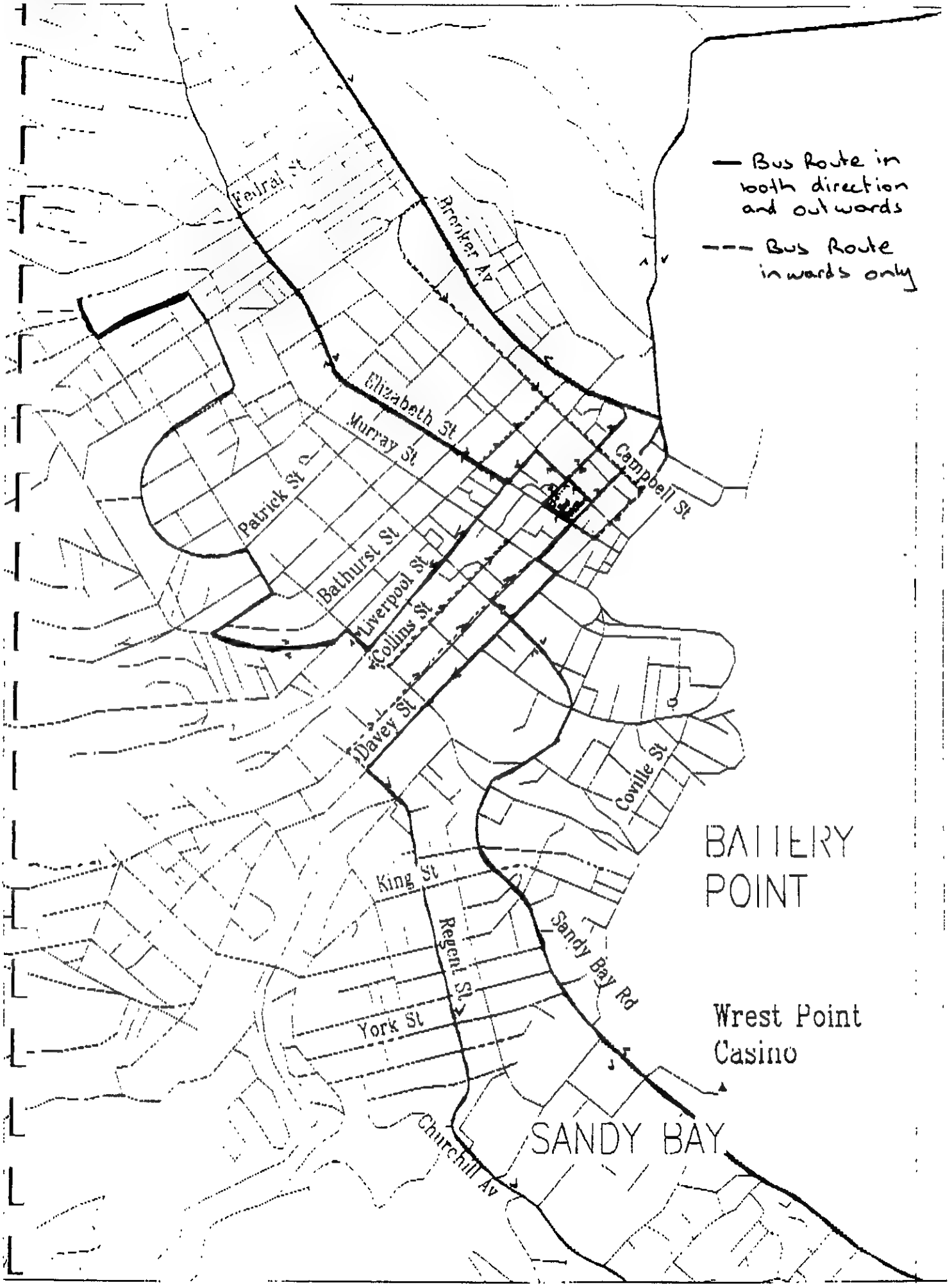
TELECOM ASSETS

Summary of Telecom conduits present underneath either the left or right hand side footpaths.

Elizabeth Street	***Number of 100 mm diameter conduits***
Federal to Lefroy	8 x 100 dia. LHS Footpath
Lefroy to Burnett	16 x 100 dia. LHS Footpath
Burnett to Tasma	20 x 100 dia. LHS Footpath
Tasma to Warwick	20 x 100 dia. RHS Footpath
Warwick to Patrick	20 x 100 dia. RHS Footpath
Patrick to Brisbane	20 x 100 dia. RHS Footpath
Brisbane to Melville	20 x 100 dia. RHS Footpath
Melville to Bathurst (exchange)	20 x 100 dia. RHS Footpath
Bathurst to Liverpool	8 x 100 dia. RHS Footpath
Liverpool to Collins	8 x 100 dia. RHS Footpath 2 x 100 dia. LHS Footpath
Collins to Macquarie	3 x 100 dia. LHS Footpath 9 x 100 dia. RHS Footpath
Macquarie to Davey	6 x 100 dia. LHS Footpath
Davey to Morrison	6 x 100 dia. LHS Footpath
Morrison Street	
Murray to Salamanca	1 x 100 dia. LHS Footpath
Murray Street	
Liverpool to Collins	2 x 100 dia. LHS Footpath
Collins to Macquarie	3 x 100 dia. RHS Footpath
Macquarie to Davey	2 x 100 dia. RHS Footpath
Davey to Morrison	4 x 100 dia. LHS Footpath 1 x 100 dia. RHS Footpath
Argyle Street	***Number of 100 mm diameter conduits***
Morrison to Davey	?
Davey to Macquarie	none
Macquarie to Collins	4 x 100 dia. LHS Footpath 1 x 100 dia. RHS Footpath
Collins to Liverpool	2 x 100 dia. LHS Footpath
Liverpool Street	
Argyle to Elizabeth	6 x 100 dia. RHS Footpath 2 x 100 dia. LHS Footpath
Elizabeth to Murray	?

APPENDIX D

BUS ROUTES


— Bus Route in both direction and outwards
--- Bus Route inwards only
Federal St
Brooker Av
Elizabeth St
Murray St
Patrick St
Bathurst St
Liverpool St
Collins St
Davey St
Campbell St
Coville St
BATTERY POINT
King St
Regent St
York St
Sandy Bay Rd
Wrest Point Casino
Churchill Av
SANDY BAY

APPENDIX E

FINANCIAL ANALYSIS SPREADSHEETS

HOBART TRAMS BACK ON TRACK
FINANCIAL ANALYSIS
OPTION: STAGE 1

Costs

Item	Year 1 Cost	1 Revenue	2 Cost	2 Revenue	3 Cost	3 Revenue	4 Cost	4 Revenue	5 Cost	5 Revenue	6 Cost	6 Revenue	7 Cost	7 Revenue	8 Cost	8 Revenue
1 Substation	100,000															
2 Single Track (km)	0															
3 Double Track (km)	840,000															
4 Overhead Single (km)	0															
5 Overhead Double (km)	210,000															
6 Workshop	250,000															
7 Equipment & Jacks	130,000															
8 Lifting	20,000															
9 Points	20,000															
10 Contingencies @ 15%	235,500															
11 Rolling Stock	400,000															
12 Running Costs	0		160,000		160,000		160,000		160,000		160,000		160,000		160,000	
Total Costs	2,205,500		160,000		160,000		160,000		160,000		160,000		160,000		160,000	
Revenues																
1 Fares				87,420		87,420		87,420		87,420		87,420		87,420		87,420
2 Sales				42,000		42,000		42,000		42,000		42,000		42,000		42,000
3 Subscriptions				3,500		3,500		3,500		3,500		3,500		3,500		3,500
4 Advertising				46,800		46,800		46,800		46,800		46,800		46,800		46,800
5 Donations				30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions				0		0		0		0		0		0		0
7 Grants				0		0		0		0		0		0		0
Gross Revenue				209,720		209,720		209,720		209,720		209,720		209,720		209,720
Net Revenue		-2,205,500		49,720		49,720		49,720		49,720		49,720		49,720		49,720

Item	9 Cost	9 Revenue	10 Cost	10 Revenue	11 Cost	11 Revenue	12 Cost	12 Revenue	13 Cost	13 Revenue	14 Cost	14 Revenue	15 Cost	15 Revenue	16 Cost	16 Revenue
1 Substation																
2 Single Track (km)																
3 Double Track (km)																
4 Overhead Single (km)																
5 Overhead Double (km)																
6 Workshop																
7 Equipment & Jacks																
8 Lifting																
9 Points																
10 Contingencies @ 15%																
11 Rolling Stock																
12 Running Costs	160,000		160,000		160,000		160,000		160,000		160,000		160,000		160,000	
Total Costs	160,000		160,000		160,000		160,000		160,000		160,000		160,000		160,000	
Revenues																
1 Fares		87,420		87,420		87,420		87,420		87,420		87,420		87,420		87,420
2 Sales		42,000		42,000		42,000		42,000		42,000		42,000		42,000		42,000
3 Subscriptions		3,500		3,500		3,500		3,500		3,500		3,500		3,500		3,500
4 Advertising		46,800		46,800		46,800		46,800		46,800		46,800		46,800		46,800
5 Donations		30,000		30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0		0		0		0		0
7 Grants		0		0		0		0		0		0		0		0
Gross Revenue		209,720		209,720		209,720		209,720		209,720		209,720		209,720		209,720
Net Revenue		49,720		49,720		49,720		49,720		49,720		49,720		49,720		49,720

Item	17 Cost	17 Revenue	18 Cost	18 Revenue	19 Cost	19 Revenue	20 Cost	20 Revenue
1 Substation								
2 Single Track (km)								
3 Double Track (km)								
4 Overhead Single (km)								
5 Overhead Double (km)								
6 Workshop								
7 Equipment & Jacks								
8 Lifting								
9 Points								
10 Contingencies @ 15%								
11 Rolling Stock								
12 Running Costs	160,000		160,000		160,000		160,000	
Total Costs	160,000		160,000		160,000		160,000	
Revenues								
1 Fares		87,420		87,420		87,420		87,420
2 Sales		42,000		42,000		42,000		42,000
3 Subscriptions		3,500		3,500		3,500		3,500
4 Advertising		46,800		46,800		46,800		46,800
5 Donations		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0
7 Grants		0		0		0		0
Gross Revenue		209,720		209,720		209,720		209,720
Net Revenue		49,720		49,720		49,720		49,720
Internal Rate of Return		-7.34%						
Net Present Value @ 25%		($2,009,486.16)						
Net Present Value @ 5%		($1,760,500.29)						

HOBART TRAMS BACK ON TRACK
FINANCIAL ANALYSIS
OPTION: STAGE 1 + 2a

Costs

Item	Year 1 Cost	1 Revenue	2 Cost	2 Revenue	3 Cost	3 Revenue	4 Cost	4 Revenue	5 Cost	5 Revenue	6 Cost	6 Revenue	7 Cost	7 Revenue	8 Cost	8 Revenue
1 Substation	100,000															
2 Single Track (km)	350,000															
3 Double Track (km)	840,000															
4 Overhead Single (km)	100,000															
5 Overhead Double (km)	210,000															
6 Workshop	250,000															
7 Equipment & Jacks	130,000															
8 Lifting	20,000															
9 Points	20,000															
10 Contingencies @ 15%	303,000															
11 Rolling Stock	400,000															
12 Running Costs	0		180,000		180,000		180,000		180,000		180,000		180,000		180,000	
Total Costs	2,723,000		180,000		180,000		180,000		180,000		180,000		180,000		180,000	
Revenues																
1 Fares				180,010		180,010		180,010		180,010		180,010		180,010		180,010
2 Sales				54,000		54,000		54,000		54,000		54,000		54,000		54,000
3 Subscriptions				4,500		4,500		4,500		4,500		4,500		4,500		4,500
4 Advertising				80,400		80,400		80,400		80,400		80,400		80,400		80,400
5 Donations				30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions				0		0		0		0		0		0		0
7 Grants				0		0		0		0		0		0		0
Gross Revenue				348,910		348,910		348,910		348,910		348,910		348,910		348,910
Net Revenue		-2,723,000		168,910		168,910		168,910		168,910		168,910		168,910		168,910

Item	9 Cost	9 Revenue	10 Cost	10 Revenue	11 Cost	11 Revenue	12 Cost	12 Revenue	13 Cost	13 Revenue	14 Cost	14 Revenue	15 Cost	15 Revenue	16 Cost	16 Revenue
1 Substation																
2 Single Track (km)																
3 Double Track (km)																
4 Overhead Single (km)																
5 Overhead Double (km)																
6 Workshop																
7 Equipment & Jacks																
8 Lifting																
9 Points																
10 Contingencies @ 15%																
11 Rolling Stock																
12 Running Costs	180,000		180,000		180,000		180,000		180,000		180,000		180,000		180,000	
Total Costs	180,000		180,000		180,000		180,000		180,000		180,000		180,000		180,000	
Revenues																
1 Fares		180,010		180,010		180,010		180,010		180,010		180,010		180,010		180,010
2 Sales		54,000		54,000		54,000		54,000		54,000		54,000		54,000		54,000
3 Subscriptions		4,500		4,500		4,500		4,500		4,500		4,500		4,500		4,500
4 Advertising		80,400		80,400		80,400		80,400		80,400		80,400		80,400		80,400
5 Donations		30,000		30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0		0		0		0		0
7 Grants		0		0		0		0		0		0		0		0
Gross Revenue		348,910		348,910		348,910		348,910		348,910		348,910		348,910		348,910
Net Revenue		168,910		168,910		168,910		168,910		168,910		168,910		168,910		168,910

Item	17 Cost	17 Revenue	18 Cost	18 Revenue	19 Cost	19 Revenue	20 Cost	20 Revenue
1 Substation								
2 Single Track (km)								
3 Double Track (km)								
4 Overhead Single (km)								
5 Overhead Double (km)								
6 Workshop								
7 Equipment & Jacks								
8 Lifting								
9 Points								
10 Contingencies @ 15%								
11 Rolling Stock								
12 Running Costs	180,000		180,000		180,000		180,000	
Total Costs	180,000		180,000		180,000		180,000	
Revenues								
1 Fares		180,010		180,010		180,010		180,010
2 Sales		54,000		54,000		54,000		54,000
3 Subscriptions		4,500		4,500		4,500		4,500
4 Advertising		80,400		80,400		80,400		80,400
5 Donations		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0
7 Grants		0		0		0		0
Gross Revenue		348,910		348,910		348,910		348,910
Net Revenue		168,910		168,910		168,910		168,910
Internal Rate of Return		1.70%						
Net Present Value @ 25%		($2,057,097.00)						
Net Present Value @ 9%		($1,211,236.11)						

HOBART TRAMS BACK ON TRACK
FINANCIAL ANALYSIS
OPTION: 5 + 2b

Costs

Item	Year 1 Cost	1 Revenue	2 Cost	2 Revenue	3 Cost	3 Revenue	4 Cost	4 Revenue	5 Cost	5 Revenue	6 Cost	6 Revenue	7 Cost	7 Revenue	8 Cost	8 Revenue
1 Substation	100,000															
2 Single Track (km)	700,000															
3 Double Track (km)	840,000															
4 Overhead Single (km)	200,000															
5 Overhead Double (km)	210,000															
6 Workshop	250,000															
7 Equipment & Jacks	130,000															
8 Lifting	20,000															
9 Points	30,000															
10 Contingencies @ 15%	372,000															
11 Rolling Stock	400,000															
12 Running Costs	0		200,000		200,000		200,000		200,000		200,000		200,000		200,000	
Total Costs	3,252,000		200,000		200,000		200,000		200,000		200,000		200,000		200,000	
Revenues																
1 Fares				235,000		235,000		235,000		235,000		235,000		235,000		235,000
2 Sales				60,000		60,000		60,000		60,000		60,000		60,000		60,000
3 Subscriptions				5,000		5,000		5,000		5,000		5,000		5,000		5,000
4 Advertising				120,000		120,000		120,000		120,000		120,000		120,000		120,000
5 Donations				30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions				0		0		0		0		0		0		0
7 Grants		0		0		0		0		0		0		0		0
Gross Revenue		0		450,000		450,000		450,000		450,000		450,000		450,000		450,000
Net Revenue		-3,252,000		250,000		250,000		250,000		250,000		250,000		250,000		250,000

Item	9 Cost	9 Revenue	10 Cost	10 Revenue	11 Cost	11 Revenue	12 Cost	12 Revenue	13 Cost	13 Revenue	14 Cost	14 Revenue	15 Cost	15 Revenue	16 Cost	16 Revenue
1 Substation																
2 Single Track (km)																
3 Double Track (km)																
4 Overhead Single (km)																
5 Overhead Double (km)																
6 Workshop																
7 Equipment & Jacks																
8 Lifting																
9 Points																
10 Contingencies @ 15%																
11 Rolling Stock																
12 Running Costs	200,000		200,000		200,000		200,000		200,000		200,000		200,000		200,000	
Total Costs	200,000		200,000		200,000		200,000		200,000		200,000		200,000		200,000	
Revenues																
1 Fares		235,000		235,000		235,000		235,000		235,000		235,000		235,000		235,000
2 Sales		60,000		60,000		60,000		60,000		60,000		60,000		60,000		60,000
3 Subscriptions		5,000		5,000		5,000		5,000		5,000		5,000		5,000		5,000
4 Advertising		120,000		120,000		120,000		120,000		120,000		120,000		120,000		120,000
5 Donations		30,000		30,000		30,000		30,000		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0		0		0		0		0
7 Grants		0		0		0		0		0		0		0		0
Gross Revenue		450,000		450,000		450,000		450,000		450,000		450,000		450,000		450,000
Net Revenue		250,000		250,000		250,000		250,000		250,000		250,000		250,000		250,000

Item	17 Cost	17 Revenue	18 Cost	18 Revenue	19 Cost	19 Revenue	20 Cost	20 Revenue
1 Substation								
2 Single Track (km)								
3 Double Track (km)								
4 Overhead Single (km)								
5 Overhead Double (km)								
6 Workshop								
7 Equipment & Jacks								
8 Lifting								
9 Points								
10 Contingencies @ 15%								
11 Rolling Stock								
12 Running Costs	200,000		200,000		200,000		200,000	
Total Costs	200,000		200,000		200,000		200,000	
Revenues								
1 Fares		235,000		235,000		235,000		235,000
2 Sales		60,000		60,000		60,000		60,000
3 Subscriptions		5,000		5,000		5,000		5,000
4 Advertising		120,000		120,000		120,000		120,000
5 Donations		30,000		30,000		30,000		30,000
6 In-kind contributions		0		0		0		0
7 Grants		0		0		0		0
Gross Revenue		450,000		450,000		450,000		450,000
Net Revenue		250,000		250,000		250,000		250,000
Internal Rate of Return		4.11%						
Net Present Value @ 25%		($2,266,411.52)						
Net Present Value @ 9%		($1,014,471.31)						